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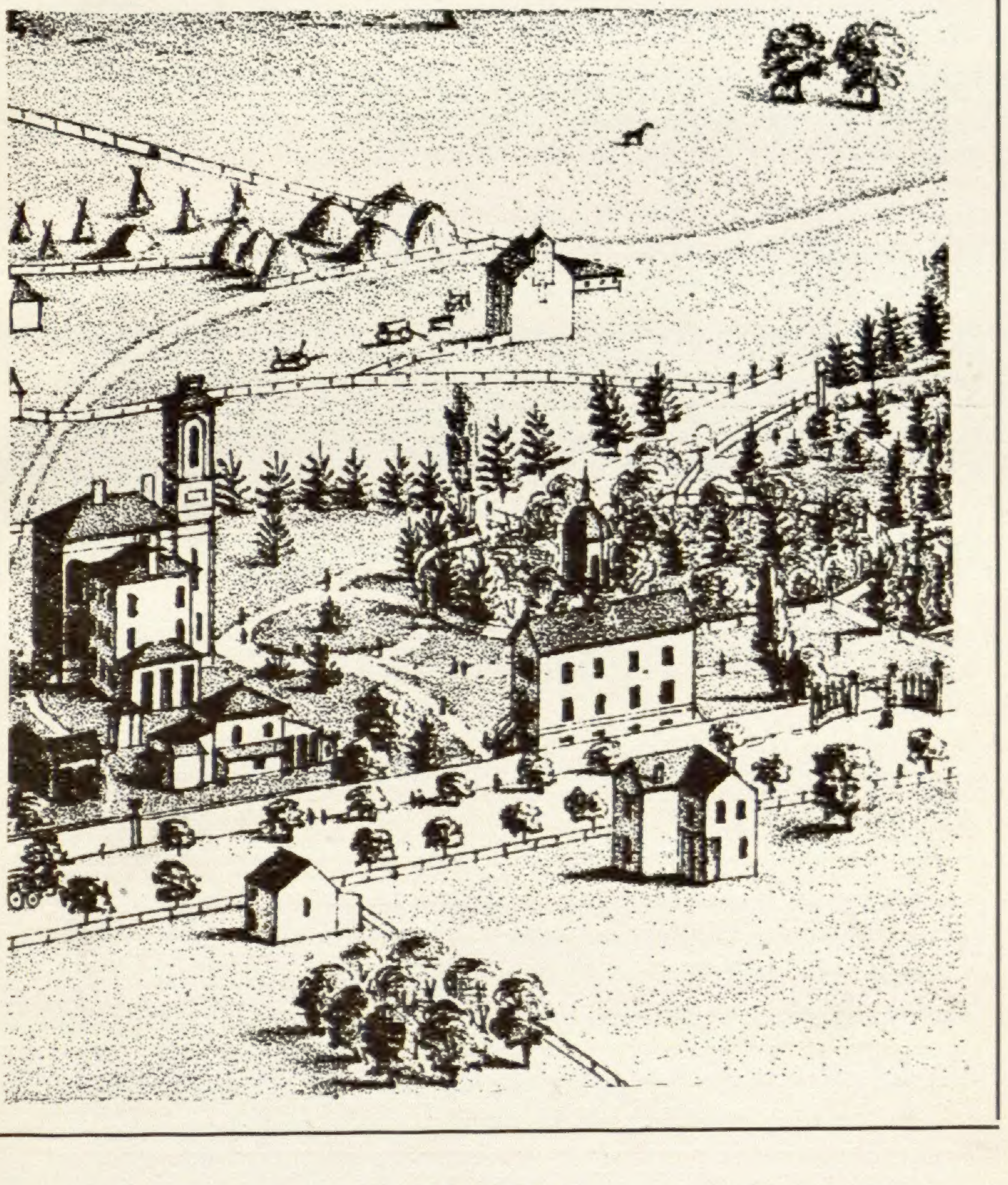

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Missouri Botanical Garden Bulletin

Vol. XLII JANUARY, 1954 No. 1

TOWER GROVE IN THE 1870's

EDGAR ANDERSON

This charming sketch is a portion of one of the plates from Compton's *Views of St. Louis*, published in 1876. It shows Mr. Shaw's country home "Tower Grove" nearly twenty years after Henry Shaw had definitely set out to make it into a first-class botanical garden. At the left of the picture is Tower Grove itself, or the "Old Residence" as it is usually called today. It is shown in its original form before the east half was torn down and rebuilt. The present Tower Grove Avenue runs diagonally across the picture with the high limestone wall which still shuts off the Garden from the outside world. The Cleveland Avenue Gate is at the right-hand margin of the picture substantially as it is today, and to the left of it is the Museum built by Mr. Shaw in 1859. In back of the Museum is the original grove, beloved by Mr. Shaw and responsible for the latter half of the name he chose for his country home. Though this picture was made more than ten years before Mr. Shaw's death, his mausoleum is shown already in place in the Grove.

Of some general interest are the large evergreen trees which figure so prominently in the sketch. They were a feature of this part of the Garden in Mr. Shaw's day, but as the city grew out around the garden and the smoke problem became worse and worse the entire collection virtually disappeared. By the time smoke control made it possible to grow some evergreens again, only one or two ailing Austrian Pines were left.

A NOTE ABOUT THIS SPECIAL NUMBER OF THE BULLETIN

The annual report which has been for years a feature of the January BULLETIN will this year be prepared in a somewhat condensed mimeographed form for the staff and the trustees. Subscribers who would care to see the report may obtain a copy by writing the editor of the BULLETIN.

This month we are devoting the entire number to articles previously published in the BULLETIN and now out of print, for which there is a continuing demand.

GROWING ROSES

PAUL A. KOHL

The rose is the only flower that every one knows and loves. Many books on rose culture have been written, and every garden magazine devotes pages to this flower each year. New varieties are constantly being added to the already-long list of hybrid tea roses; membership in the American Rose Society is on the increase; local rose societies are being formed in many communities, one of the most recent being in St. Louis; and so the interest in the rose continues unabated. Small wonder, then, that information is constantly being sought by those who are just taking up rose culture, or by those who are meeting with difficulties or are interested in enlarging their collections.

Current rose catalogues place considerable emphasis on hybrid tea roses. They are first, if the popularity of the different groups of roses is measured by the number of varieties offered in the catalogues, some nurseries listing between seventy and eighty varieties. Polyanthas and their large-flowered cousins, called floribundas, are second with twenty to thirty varieties; and climbing roses are third, the list of available varieties being from twelve to thirty-five. Other groups, but of less importance, are the pillar roses, the shrub roses, the old-fashioned roses and the miniatures.

Hybrid Tea Roses.—These roses are practically ever-blooming; they commence flowering in May and continue until frost. Given a reasonably good soil all varieties will thrive in the garden, and if they are protected during the winter they will grow in succeeding years. Roses, like people, are individuals, and some varieties are sturdier than others. Thus, in time certain roses are recognized throughout the country as being superior, and these maintain their popularity for many years. The rose catalogues picture and describe many new roses each year. A beginner will find it difficult to select a few good varieties without some guidance, but he can be assured of purchasing good ones if he selects those marked with the insignia bearing the letters "AARS." Varieties so marked represent the "All American Rose Selections," being reliable roses after they have had a thorough trial in all parts of the United States. Another source of information is the "Proof of the Pudding" in the American Rose Society's annuals, which contains comments on the performance of the newest roses by rose growers from different parts of the United States. Each year the American Rose Society also issues a *Guide for Buying Roses* which includes the national ratings. A score of 10 would be the perfect rose, but the nearest approach to perfection in the 1953 guide is "Crimson Glory" with a score of 9.5, followed by "Peace" with 9.4.

Polyantha Roses.—The word "polyantha" means many-flowered. Formerly most of the roses in this group had small flowers, but in recent years hybridizers have created varieties with flowers nearly as large as the hybrid teas, and these have been called "floribundas." As a group they are very popular because they bloom so freely throughout the season and are fine for mass displays in the garden.

Hybrid Perpetuals.—Many years ago hybrid perpetuals were almost the only roses grown. They can stand the changeable winter weather better than the hybrid tea roses. The flowers, for the most part, are double, pink, red, or white, with a few partly yellow; some are very fragrant, others slightly so or not at all. The plants are tall, and some varieties have very thorny canes. Their best period of bloom is in June, only a few varieties, as "Frau Karl Druschki," producing a second crop of flowers in late summer.

Shrub Roses.—Closely resembling the hybrid perpetuals in hardiness and vigorous growth are the various shrub roses, such as rugosa roses, sweetbriers, and the species roses of which our native prairie rose, *Rosa setigera,* is an example.

Climbing Roses.—From the standpoint of flower size and time of bloom the climbing roses may be divided into two groups: the large-flowered ones which commence to bloom about May 15, and the small, cluster-flowered ramblers which bloom during the first and second week of June. The climbing hybrid tea roses represent a class that blooms during the summer and fall. They require several years to become established and must be protected during the winter.

Miniature Roses.—These dwarf fairy roses are charming reproductions of the large-flowered hybrid tea roses. The buds of some of them measure less than one-quarter of an inch and yet they are as perfectly formed as any of the larger roses. Since the plants are small they should be grown in separate beds or in pots.

The Rose Bed.—Hybrid tea roses may be grown along the front of shrub beds or planted among perennials, but when a dozen or more are grown it is simpler to care for them in one bed. Roses should receive at least half a day of sunshine. If they are planted near shallow-rooted trees, such as the elm and maple, they suffer not only from the shade cast by the trees but also from lack of water and food which the tree roots take. Low places are undesirable for rose beds. Because the soil is wet most of the year, the plants are in danger of being heaved by the frost in winter and finally killed.

Soil.—In this area the soil is a fairly heavy clay loam, and if other plants have been grown successfully in it for some years it is in reasonably good condition for roses. So often, however, the soil about the home consists

HYBRID TEA AND SHRUB ROSES IN A ST. LOUIS GARDEN

mostly of subsoil which was spread after the house was built. In the process of leveling much of the building material, such as sand, mortar, and broken bricks, was covered with a few inches of soil. It is a chore like the removal of this building trash from the soil that takes the joy out of gardening, but it must be done. About the best way to proceed with the preparation of a rose bed is to remove the upper six inches of soil and throw it to one side. Superphosphate is then spread in the trench at the rate of about three pounds to every 100 square feet of bed area. This is spaded into the subsoil and then the topsoil is returned to the bed. Both layers of soil will be improved by the addition of leafmold or peat moss at the rate of two to four bushels to every 100 square feet of bed. A good compost pile should be maintained in every garden to supply additional humus whenever it is needed. A newly spaded rose bed should be allowed to settle several weeks before the roses are planted. If this is not possible, then the soil should be firmed as it is returned to the bed.

Rose Plants.—Almost all the roses that are purchased from nurseries or stores are budded plants, as this is the method by which roses are produced commercially. Dormant roses should be planted in March if possible, and planting may be continued into April. The later in spring dormant roses are planted the less chance they have of becoming established before warm weather sets in. Pot-grown roses may be planted any time and will grow if carefully handled so that the ball of soil surrounding the roots does not fall apart. Roses may also be planted in October or November providing the plants are obtainable. In December weather conditions usually prevent proper planting, and the soil is too cold for any root action.

Planting.—Roses should be unpacked soon after being received. If it is impossible to plant them immediately they should be "heeled-in," that is, the roots and most of the tops covered with damp soil.

It is surprising how rapidly roses dry out when they are exposed to the wind and sun while the holes are being dug. To avoid this, the plants may be taken to the garden in a bucket of water or the roots may be dipped in water and the plants wrapped in paper or burlap.

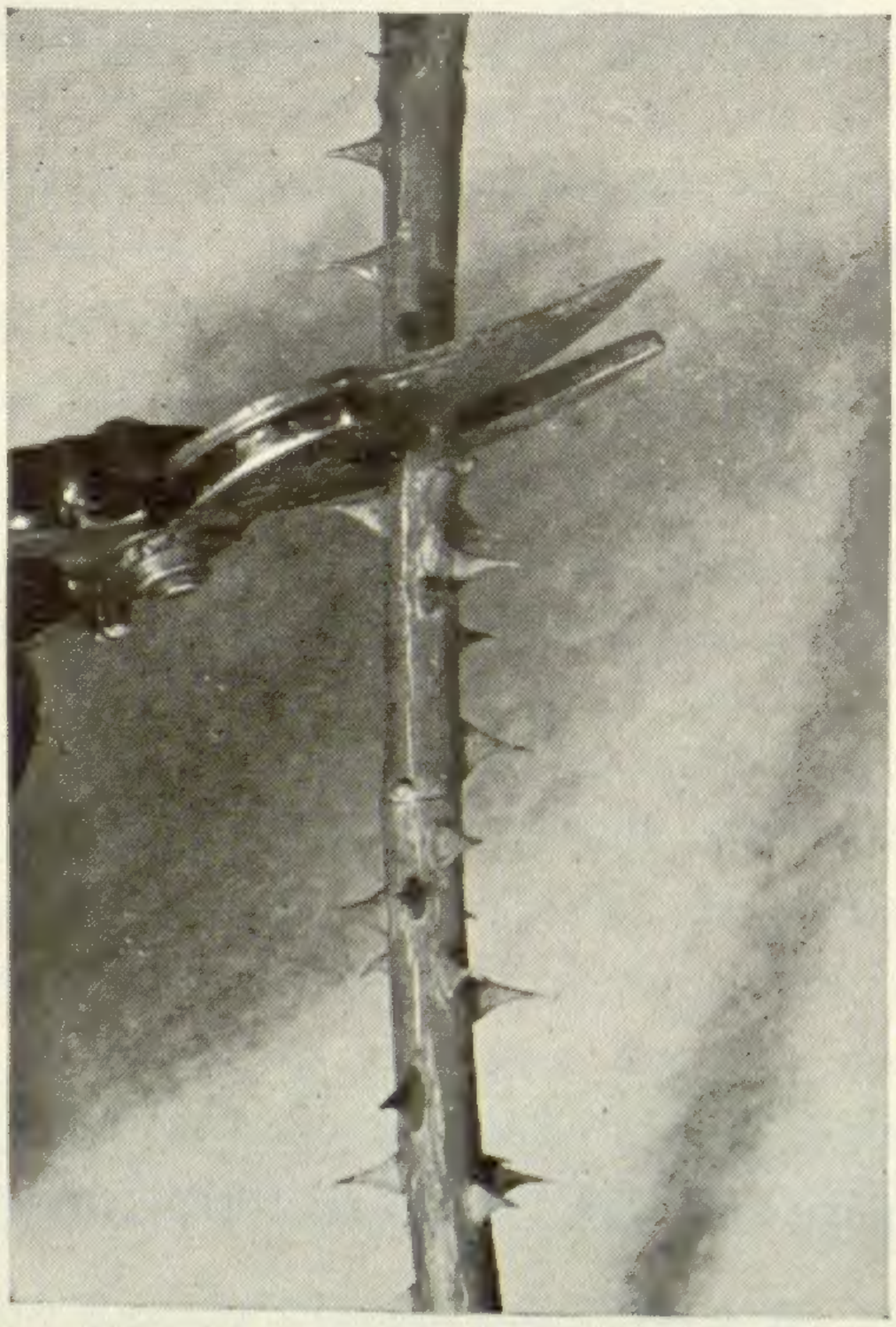
The hole to receive the rose should be large enough to accommodate the roots without crowding. Leave a slight mound or cone of soil in the center and on this spread the roots. The knob (that place where the rose is budded) should be level with the surface of the soil. This will allow for settling and eventually the budded portion will be an inch beneath the surface. Work the soil between the roots with the fingers. (A good pair of leather gloves will be found indispensable for this work.) Add more soil as needed and finally firm with the feet. Leave a depression around each plant, into which pour a half pail of water after all the roses are planted. This helps to settle the soil and prevents any loss of roses from drying out. When the water has drained away the remaining soil is drawn around the plants and mounded to about six inches to protect the buds until they form new shoots. Later this soil is washed down by rains or leveled off when the beds are cultivated.

Planting Distances.—The dwarf polyanthas and the majority of hybrid tea roses should be planted fifteen to twenty inches apart; large hybrid tea roses, as "Radiance," two feet; hybrid perpetuals, two to three feet; and rugosa and shrub roses at least four feet apart. Climbing and rambler roses are planted singly at the bases of arches or pillars. On fences or trellises they should be spaced eight to ten feet apart, while unusually strong-growing varieties, like "Dr. Van Fleet," may be even farther apart.

Watering.—Drought periods may occur in June, July or August. When the upper layer of soil becomes dry the growth of the bush roses is checked.

PLANTING A DORMANT ROSE

HYBRID TEA ROSE IN MARCH
Remove weak and dead canes and sucker at left



PROPER PRUNING CUT ABOVE A BUD

Shrub and climbing roses have a deeper root system and do not show the effects of drought so quickly. Rose beds should be soaked once or twice a week during dry periods, the early morning being a good time if a fountain sprinkler is used. Wetting of the foliage in the evening tends to spread diseases. If the rose beds are watered in the evening it is better to use a canvas hose soaker or to flood the beds with the open end of the hose laid on a board to prevent washing the soil.

Insects.—Since the insects which attack roses do most of their damage early in the season it is wise to have the materials on hand with which to fight them, also sprayers and dusters in working order. Gardeners should learn to recognize the kind of insects which feed on roses and know the remedy.

Aphis appear each spring. They are easily controlled if the roses are sprayed with any contact insecticide containing nicotine or pyrethrum. Sometimes they are tough and a double-strength solution is needed to kill them. Another infestation occurs a few days later when those with wings are blown in by the wind, and this calls for a second and third spraying.

A number of chewing insects appear every year, of which the rose slugs are the worst. They skeletonize the leaves so quickly that the damage is done before the spray gun has been brought into play. They begin feeding on the underside of the leaves in May and do most of the damage by early June. If the roses are sprayed in early May with arsenate of lead and again after heavy rains in anticipation of an attack, the slugs will be controlled. Several kinds of beetles eat the tips of rose buds or bore into them. Leaf cutter bees cut perfect circles from the leaves, and, like the beetles, they are difficult to control. Stem borers sometimes injure rose canes. They enter the stem where it has been recently pruned and as they bore down they interfere with the flow of sap. Very little can be done to prevent this type of injury. The pruning cuts are sometimes painted or covered with grafting wax, but it is questionable whether the time spent in treating each wound is worth the effort. New pesticides are being introduced every year and are usually more effective than the ones previously used. However, they are also toxic to man and must be used with caution.

In some years red spider mites cause partial defoliation of the roses during June and July. These mites draw the sap from the underside of the leaves, and to dislodge them the plants should be syringed with a strong stream of water. When spider mites become a serious pest use Aramite.

Some roses, particularly the rugosas, are subject to various scale insects, such as oyster shell and scurfy scale. When the entire cane is covered with scale it should be cut away at the base of the plant and burned. Spray these roses with an oil spray during the winter.

MILDEW

BLACK SPOT

APHIS

CATERPILLARS

DISEASES AND INSECTS

If tender rose tips wither and turn black and few flower buds develop during the summer, it is quite certain that rose midge has invaded the garden and the injury is not due to heat as was formerly supposed. This insect has been prevalent in greenhouses for many years, but only about ten years ago was it recognized as a serious garden pest. Dr. W. E. Blauvelt, of Cornell University, studied this insect and its control and on various occasions reported his observations in the *American Rose Annuals*. In describing his work in the 1946 *Annual*, Dr. Blauvelt considered DDT the most promising insecticide and recommended about 1½ tablespoonfuls of 25% wettable DDT powder to one gallon of water. This may be combined with the other new spray material "Fermate," and if the Grasselli Spreader Sticker is added we have one of the best combination sprays, that will control a number of insects and the diseases affecting the rose.

Diseases.—Several fungous diseases plague the roses, the most serious one being black spot. It occurs in every rose garden, and the intensity of the attack varies each year with weather conditions. The disease is on the roses long before it is recognized, but by the time the leaves develop the characteristic spots and drop to the ground it has made such inroads that nothing can be done to prevent premature defoliation. The control of black spot calls for a spraying or dusting program that continues uninterruptedly from spring until fall. For many years Massey dust (named for Dr. L. M. Massey, of Cornell University, who has done much research on black spot) has been the standard spray or dust in controlling this disease. Massey dust consists of 9 parts dusting sulphur and 1 part arsenate of lead. If roses are dusted or sprayed at ten-day intervals, and with an occasional extra dusting during rainy periods, one can feel reasonably sure of checking this disease. It is not possible to stamp it out but it can be held in check. The new material, "Fermate," has given promising results in black spot control. Any other diseases which affect roses will be controlled by the same fungicides used for black spot, with one exception—Fermate will not control mildew.

Dusting and Spraying.—Gardeners have a choice of dusting or spraying their roses. Either way is effective and each has certain advantages. Dusting guns are quickly loaded and can be used on short notice, as just before a rain. They are also cheaper than sprayers, and the latest types weigh less and are very easy to use. In order to get good coverage, dusting must be done when there is little wind, in the morning or the evening. The wearing of goggles is recommended, for if sulphur gets in the eyes they smart for some time.

1

2

3

4

1. SCURFY SCALE ON RUGOSA ROSE
2. COMPRESSED-AIR SPRAYER
3. SMALL DUSTER
4. LARGE DUSTER WITH BELLOWS

Fermate can be stirred into dusting sulphur in a bucket in much the same way that paint is mixed, using 10 per cent Fermate and 90 per cent dusting sulphur. DuPont's Garden Dust contains DDT, Fermate, Rotenone, and several other materials which makes it an all-purpose dust. Pomo-green with nicotine is another fungicide easily used in the duster, as is also Massey dust which has already been mentioned.

Good quart-size compressed-air sprayers and the larger two- and three-gallon ones are available for those who prefer to use liquids instead of dusts. Tri-ogen, the all-purpose spray, will control sucking and chewing insects and fungous diseases. Wettable sulphur can be used at the rate of 2 tablespoonfuls to one gallon of water, plus 5 to 8 drops of Grasselli Spreader Sticker. Fermate is used at the rate of 2 tablespoonfuls to the gallon of water or, if combined with sulphur, 2 teaspoonfuls of Fermate and 2 tablespoonfuls of sulphur to the gallon. A set of aluminum measuring spoons is an indispensable item for the gardener's spray shelf. Fermate and DDT do not mix well with water. DDT should be shaken with a cupful of water in a Mason jar before being added to the full amount of water. When Fermate is to be mixed with water, stir a few drops of spreader-sticker in a glass jar of about two quarts capacity, add two tablespoonfuls of Fermate, clamp the lid, and shake vigorously. Pour this mixture into the spray tank and add water to make a gallon of solution.

The success or failure of the various fungicides is directly dependent upon the timing of the applications. Frequent rains necessitate several dustings or sprayings. During dry weather the applications can be spaced at two-week intervals and during the hottest and driest weather dispensed with entirely. Sulphur injures the leaves if used when the temperature is above 90 degrees. Fermate can be used alone during those periods as a spray or combined with talc instead of sulphur.

Fertilizing.—The following fertilizers for roses are suggested:

Commercial fertilizers with a 4-12-4 or similar formula. Apply half a handful to a plant and cultivate it into the soil in April and June. Use more for large climbing and shrub roses.

Rose food (7-8-5).

Dried and shredded cattle manure.

Completely soluble fertilizers have come into use in the last few years. They are more expensive than commercial fertilizers but they are very easily used. A teaspoonful of fertilizer to a quart of water dissolves instantly and can be poured over the plant without any danger of burning the foliage. Feeding plants through their leaves has captured the imagination of many gardeners, and while foliar feeding is effective, plants will also improve if fed through the roots.

CLIMBING ROSES ON LINNEAN HOUSE

From left to right: Purity, Milky Way, Wartburg, Christine Wright, Purity, Mary Wallace, Dr. W. Van Fleet, Paul's Scarlet Climber.

Discontinue feeding roses by August 15.

The problem of rose fertilization is complex, and there is still much to be learned. Almost every issue of the *American Rose Annual* or *The Rose Magazine* contains information on this subject which gives a fuller appreciation of the problems involved.

Summer Mulching.—An artificial mulch during summer prevents weeds, conserves moisture, and insulates the soil against the hot rays of the sun. Peat, buckwheat hulls, and spent hops may be used. About a two-inch layer of any of these materials should be applied to the rose beds in early June and left until the end of August or early September. Mulching material should not be heaped around the base of the roses as the stems are sometimes burned when the weather is damp and hot. Some rose growers contend that artificial mulches aid the spread of black spot.

Pruning Climbing Roses.—The term "climbing roses" is applied to the large-flowered varieties whose flowers are borne on laterals a foot or more long. These roses do not produce numerous canes from the base of the plants each year but many of the new growths start from the two- and three-year-old canes. The "rambler" roses, "Dorothy Perkins," for instance, annually produce many strong and fast-growing shoots from the base of the plant. Both climbers and ramblers should be pruned during the summer. The large-flowered kinds should be thinned so that half of the remaining

wood is two or more years old and the other half of the current season's growth. Varieties such as "Dr. Van Fleet" grow so rapidly after the summer pruning that it becomes necessary to do some additional thining in the spring.

It might be well to pause for a moment in the discussion of pruning to say a few words about the pruning tools. The pruning shears are used more than any other tool. They should be strong, made of good steel, and may be either single-edged or double cut. To cut canes a half inch or more in diameter, a pair of lopping shears, with 24-inch handles, is the proper tool. Climbing roses are thorny and have a nasty way of catching in clothing. The lopping shears will be found indispensable in picking up long and unruly canes and dragging them away. When the crowded condition of the stems makes it impossible to cut heavy basal canes with lopping shears a key-hole saw is the tool to use.

In pruning rambler roses almost all the canes which bore flowers in June should be removed. There will be many new canes at the base of the plants to replace them. Such treatment seems drastic, but it is surprising how fast the new shoots grow. Before pruning, all of the canes should be removed from the trellis and laid on the ground. The old canes are then severed at the base and the new ones tied in place. When the ramblers are badly tangled, the old canes must be cut away in sections. It may be stated at this point that if rose canes have been tied to one side of the trellis, instead of being woven between the bars, it is much easier to remove them before pruning. Ramblers on large arches or trellises are not pruned so severely.

Propagating Roses.—A great deal of the interest and fascination of growing roses is centered in their propagation, and nearly all rose-growers practice it with varying results. Some of the climbing, polyantha, and strong-growing bush roses thrive as well on their own roots as do the budded plants. Many of these roses are rooted by the popular Mason-jar method. The cuttings are usually made in the autumn from blooming wood. About three inches of the stem immediately beneath the spent flower is cut away, the next six inches of wood yielding a good cutting. The basal cut is made immediately beneath a bud. Remove all leaves except the upper two or three. A rose leaf is a compound leaf, each leaf usually being composed of five or seven leaflets. When it is said that all of the leaves, except the upper two or three, should be removed, the statement refers to the compound leaves and not to the leaflets. Several additional cuttings can usually be made from the same stem. These cuttings are inserted at least two inches deep in light soil and covered with a glass jar pressed into the soil. When colder weather occurs some additional soil is heaped around the base of the

Thin canes yield the best summer cuttings

Winter cuttings under glass jar

PROPAGATING ROSES

HILLING ROSES IN NOVEMBER

ROSES PROTECTED WITH PENNISETUM GRASSES

jars. The cuttings may be placed in a spot where the rose bush is to grow or they may be started in a specially prepared bed and transplanted a year later. They are kept under the jar during the fall and winter but in late April or May they are gradually hardened by removing the jar a few hours each day.

Roses may also be grown from cuttings made in June, or August and September. Such cuttings are made three to four inches long, from firm, twiggy wood, with one leaf at the top. Rooting can be hastened and improved by first dipping the cuttings in one of the root-forming chemicals. Moisten the end of the cutting, shake off the water, dip in the hormone powder, tap the cutting on the edge of the container to remove the surplus powder, and then insert it in the rooting medium with a dibber. Summer cuttings are inserted in flats or pans of sand and placed in a cool and shaded spot. Meramec sand packs tightly and does not need as much water as the coarser Mississippi River sand. Spray the cuttings several times a day the first two weeks and always shield them from the wind with cloth or, better still, polyethylene sheeting. After the third week some varieties will have rooted, and these are potted when the roots are at least an inch long. The most recent medium in which to root cuttings is vermiculite. The grade best suited is sold under the trade name "Terra-Lite." It is sterile, very light weight, retains a great deal of moisture, yet drains well. Try it and you can be assured of excellent results. Incidentally, there is no better material in which to sow seeds.

Climbing roses can be rooted by layering. This is done in early spring by bending some of the long canes to the ground and covering the bent sections with six inches of soil. A piece of wire, shaped like a hair pin, will hold the stem in place. The loose end of the cane is tied to a stake or the trellis. In March of the following year the cane is severed from the parent plant and set in its new location. Climbing roses will root more quickly if a cut is made half way through the stem and a small stone inserted in the cut surfaces before it is pegged down and covered. They also root easily from thin, but firm, greenwood cuttings.

Winter Protection.—About mid-November the soil should be hilled up around the base of the hybrid tea roses, with the work completed by Thanksgiving. Soil from the border of the bed and from between the plants is used. This is the best way to protect hybrid tea roses, but additional protection can be given when material is available. Baled straw is useless as most of it is too short. Excelsior is fairly good; ornamental grasses, both annual and perennial, furnish good mulching material; and oak leaves can be used if held in place with chicken netting. In late November the plants are given a winter mulch to shield them against the wind and the sun.

Polyantha, hybrid perpetual, and climbing roses pass through normal winters without the additional mulch. Roses should not be uncovered too soon in the spring. Warm weather in February will induce the buds to swell, but each year these spells are followed by a freeze. Winter mulches are removed when the roses are pruned in late March or early April.

Spring Pruning.—All roses require some pruning each year. Polyantha roses should have the weak wood and some of the older canes removed. The remaining stems are cut back to about a foot.

Hybrid tea roses receive the most pruning. In severe winters much of the wood is frozen as far back as the mulch, but varieties differ in their hardiness. When grown for garden display they should be moderately pruned. Three to six canes are left to each plant and these are pruned to twelve to twenty-four inches, the cut being made above an outside bud. Frozen wood is shriveled and brown but sound wood is green and the buds are plump.

Most of the new canes of the hybrid perpetuals grow from the base of the plants after the blooming period. Some of these canes grow six feet tall. At whatever height they are pruned in the spring, the flower-bearing laterals will develop near the top. The number of flowers of the hybrid perpetuals can be increased by tying the long canes horizontally. Most of the old flowering canes are removed during the summer.

When pruning rugosa roses examine them closely, as they frequently are infested with scale. Single rugosa roses are pruned to a height of three or four feet and the hybrid rugosas to four to five feet. Shrub roses should always have the wood removed at the base.

Rose varieties.—In answer to the many requests the Garden receives for names of suitable roses for this locality the following partial list, with ratings of hybrid teas and floribundas, has been compiled from the *Guide for Buying Roses* which is issued by the American Rose Society:

HYBRID TEA ROSES

Red—

Crimson Glory	9.5
Charlotte Armstrong	9.0
Etoile de Hollande	8.9
Christopher Stone	8.8
Grand Duchesse Charlotte	8.3

Yellow—

Eclipse	8.5
Golden Dawn	8.1
Debonair	7.9
McGredy's Yellow	7.9
Soeur Therese	7.9

Blends—

Peace	9.4
Mme. Henri Guillot	8.9
Good News	8.4
Helen Traubel	8.4
Mrs. Sam McGredy	8.3

Pink—

Picture	8.4
Radiance	8.2
Show Girl	8.2
Mrs. Chas. Bell	8.0
The Doctor	7.9

White—

Pedralbes	8.0
McGredy's Ivory	7.8
White Wings	7.7
Snowbird	7.6
Mme. Jules Bouche	7.3

FLORIBUNDAS

Red—

Red Pinocchio	8.7
Donald Prior	8.6
Floradora	8.2
World's Fair	8.2
Permanent Wave	8.1

Yellow—

Goldilocks	7.9
Marionette	7.2
Yellow Pinocchio	6.4

Pink—

Fashion	9.5
The Fairy	9.3
Betty Prior	8.8
Else Poulsen	8.7
Pinocchio	7.6

White—

Summer Snow	8.4
Dagmar Späth	8.2
Irene of Denmark	7.3

RUGOSA ROSES AND HYBRIDS

Agnes
Conrad Ferdinand Meyer
F. J. Grootendorst
Hon. Lady Lindsay
Nova Zembla
Pink Grootendorst
Rosa rugosa alba and R. rugosa alba-plena
Sarah Van Fleet
Vanguard

SHRUB AND SPECIES ROSES

Blanche Moreau
Crested Moss
Harison's Yellow
Rosa Hugonis
Penelope
Rosa setigera

TRAILING ROSES

Max Graf
Rosa Wichuraiana

CLIMBING ROSES

American Pillar
Blaze
Chevy Chase
Doubloons
Dr. Huey
Evangeline
Excelsa
Dr. W. Van Fleet
Ghislaine de Feligonde
Gruss an Freundorf
Mary Wallace
Mrs. Arthur Curtiss James
Hiawatha
Paul's Scarlet Climber
Silver Moon
Wartburg
White Dorothy
New Dawn
Wichmoss

Two years ago next spring two plants of *Rosa alba* were moved from a private garden to the administration building at 2315 Tower Grove Avenue. In spite of two blistering summers they have survived and increased in a place which few modern roses would tolerate. They are on either side of what was once the front door of Mr. Shaw's old city home. They face east and get full sun all the morning, with a brick and granite wall behind them which reflects the heat.

PLANTS FOR A ST. LOUIS GARDEN

EDGAR ANDERSON

Only those who have struggled with the problem can understand the difficulties of gardening in St. Louis, and by St. Louis we mean just that, and not the area around about. The small yards, the general lack of sunshine, the high proportion of the area which is right next to a wall of some sort or other (house wall, garage wall, or a high board fence) combine to make gardening much more difficult than it is in Kirkwood or Webster, or even Richmond Heights. Added to all these general difficulties are the special ones to be found in many parts of the city, the pavement ants which will girdle Calendulas and Zinnias, the heavy red clay subsoil exposed by grading in many parts of the town and whose only proper use is for tennis courts, or the equally difficult places which were filled in with ashes and rubble with only a thin veneering of soil on top.

If you have the kind of garden in which Johnny-jump-ups will seed themselves and Korean Chrysanthemums will flower year after year with no resetting, this article is not designed for you. Some of the strong-growing plants recommended here would run wild and become a pest in such a garden. It is written rather for the real city gardener, who never digs deeply without finding a bit of brick or an old piece of crockery, and who has to learn by sad experience just which plants can be made to grow on those parts of the garden which are shaded by buildings and have no sunshine at all in the late fall and winter.

The following twenty-five plants will all thrive in the really urban parts of St. Louis. Several of them, as noted in the discussion, require sunshine, but some of them will stand a great deal of shade. As a group they will provide continuous bloom from late March to the end of October. Few of them need to be sprayed or dusted for particular pests. Most of the perennials can go ten or fifteen years without resetting, and the annuals can be counted upon to reseed themselves in at least a portion of the garden. All will benefit by fertilizer, but most of them are hardy enough to bloom without it. None of them, however, are fond of grass in the flower bed and they will require weedings, particularly in the spring before they are large enough to resist competition. They are listed roughly in the order of bloom, with shrubs and ground-covers in a special section at the end.

Narcissus FEBRUARY GOLD.—This rich yellow trumpet daffodil is a comparatively new variety and is not known to many St. Louis gardeners, but it is most vigorous and can be depended upon to give a good show of bloom before the Forsythias come into flower. The bulbs increase fairly rapidly and will need to be separated and reset in about four or five years, or replaced by newly purchased ones.

Dwarf Iris *(Iris pumila* var. *atrocaerulea)*.—This little early Iris, which comes into flower a few days after the Forsythias, should be much more widely planted here, since it is very much at home in Missouri. It wants sunlight and good drainage and it is very intolerant of grass, but is otherwise a most obliging plant. It is apparently very fond of cement and will grow well right up next to a sidewalk, or along the south side of a stone wall. It has run wild in southern Missouri and one can buy it by the bushel from old German gardens just outside the suburban area. In addition to the genuine early *Iris pumila*, whose flowers are stemless, there is another variety just a little later, with somewhat larger flowers and a very short stem, which is probably a hybrid between *Iris pumila* and *Iris chaemaeiris*. By interplanting the two varieties one can have a longer season of Iris bloom.

Narcissus Sir Watkin.—By far the sturdiest and most floriferous of all the daffodils under our conditions. It will bloom in spite of rain or sleet or snow, and the bulbs will not have to be reset for ten or fifteen years.

Iris Kochii Midnight or Black Prince.—This intermediate Iris is extremely floriferous even for an Iris, and has flowers of an intense dark purple. They are of excellent quality, and although this is one of the oldest varieties of Iris in St. Louis gardens it is still one of the best.

Iris germanica.—The modern tall bearded irises are one of the glories of middle-western gardens, but most of the varieties in current catalogues are too overbred for city conditions. One can do better by looking about in other city gardens and picking up old-fashioned varieties which will be much more dependable, if not so breath-taking. The "German Flag" irises, with their two tones of blue, will grow and blossom, almost without attention, in spots where fancier varieties will gradually die out. They don't really like shade, but they will continue to blossom in places which have a good deal of it and they are really a splendid flower, even if they are old and cheap.

Iris pallida Albert Victor.—Few of the newer hybrids will do so much for so little as this old-fashioned variety. It is no longer listed by Iris specialists but there are plenty of gardens in south St. Louis where it makes masses of soft-gray-blue every spring. If your Iris-collector friends tend to sneer at this old-timer, you may compare it with some of their more expensive new hybrids. It may not have blossoms which are as large, or spectacularly colored, but it has a perfection of form equalled by only a few of the modern varieties.

Hemerocallis (Hyperion, Calypso, and *fulva*).—The last of these is the old-fashioned orange day-lily, which can stand more neglect and grow in more kinds of places than any other flower which has ever been tried in eastern North America. You may not particularly care for it; after all, the

plant is a bit weedy, but you can put it at the back of the garden and get a mass of foliage, and a bright streak of color which will improve the garden picture as a whole. There are many beautiful new varieties of Hemerocallis, some of which do very well in the city, HYPERION and CALYPSO being outstanding under such conditions.

Annual Larkspur, Calliopsis, Bachelor's Buttons.—All three of these common annuals can be planted more or less together and all can be counted upon to seed themselves in your garden, provided it is sunny enough. Larkspurs will take the most shade and Calliopsis the least. If they don't do well in one part of your garden try them in another. They are apparently rather sensitive to soil reactions and to the presence of certain other plants. All three have a distressing habit of seeding themselves heavily in the parts of the garden where you may not particularly want them, and then failing altogether to come up in the places you had planned for. Once well established, however, they should seed themselves year after year.

Elder Daisy.—This is just a selected form of the common white daisy of meadows and pastures, but it is very free-flowering and has shortish stems which are not so apt to break and bend as those of the commoner sort. It is very responsive to sun and will crowd into the sunniest places in the garden, and yet not flourish at all in shadier spots just a few feet away.

Hollyhock.—If you grow these from seed it will take two years from seed to flower. Once the plants are well established in the garden, however, they will seed themselves, and these self-sown seedlings nearly always seem to be hardier than the original plants.

Blackberry Lily *(Belamcanda chinensis)*.—This old-fashioned flower looks much like an Iris until it blooms. The little cinnamon and orange-red flowers are borne freely all over the top of the plant and they blossom through the very middle of the summer. There is a good deal of difference in color and color pattern from plant to plant so that a selection of different plants grown near each other adds variety and interest. If one allows the flowers to go to seed, the dark shiny seeds, which give the plant its common name, will be attractive in the fall garden.

Showy Live-forever *(Sedum spectabile)*.—No matter how hot and dry early September may be, *Sedum spectabile* can be counted upon to give a good display of its misty pink flowers. The gray-green leaves make an attractive note in the flower border during the spring and summer. While it does its best in full sun and can grow in places too hot and dry for many garden perennials, *Sedum spectabile* will grow and flower in partial shade.

Blue Mist Flower *(Eupatorium coelestinum)*.—This native wild flower is something like a perennial Ageratum. It is altogether too weedy and rampant for most suburban gardens but in the city this added strength becomes a

virtue. It can easily be controlled by pulling it up from those parts of the garden where it is not wanted. It does well in the sun but can stand quite a lot of shade, and if the first flowers are cut when they begin to fade it can be kept attractive for a long period in the late summer and early fall.

Aster turbinellus.—This beautiful Ozark Aster is not yet in the trade but it transplants easily and increases rapidly enough so that once a plant has been acquired it can be increased by division. Many of our wild asters become weedier in the rich soil of a garden but not *Aster turbinellus*. It merely produces larger and larger sprays of its attractive clear blue flowers and seems even more at home in a city backyard than it did on a rocky hillside in the Ozarks.

New England Aster *(Aster novae-angliae)*.—This species is available in the trade in various shades of rose or purple. If one allows it to go to seed, volunteer seedlings will appear here and there in the garden, many of which will be worth keeping.

Ozark Allium *(Allium stellatum)*.—This beautiful bulbous plant with rosy-pink umbels of flowers from August to October is one of the choicest things for a city garden and a most dependable bloomer. It suffers from the fact that technically it is a wild onion, albeit a most beautiful one. It is not yet in the trade and if one wants it for his garden he must keep his eye open for one of those dry Missouri hillsides where it grows in great profusion. However, it transplants readily at all seasons of the year, even when it is in full bloom.

Chrysanthemums.—The last two decades have seen a great development of hardy chrysanthemums in this country. Most of these fancy new varieties can be grown successfully in the city, but nearly all of them require resetting every two or three years if they are to give a satisfactory display. If you haven't the time and energy for this keep your eyes open for old-fashioned varieties in dooryard gardens in the market-garden district. There is a very handsome variety, deep-pink fading to white, which abounds in such places around St. Louis. It will flower dependably for five to ten years without resetting, and while it doesn't like shade it can stand a good deal of it and still flower acceptably.

SHRUBS

One shrub leads all others in its adaptability to the city area, the old-fashioned snowball. It will take full sun or a good deal of shade. It grows well in poor soil and requires no special pruning. The flowers are attractive in May and its leaves hang on late and then color a beautiful red bronze before they fall.

Mock-oranges or Syringas are nearly as adaptable, though most people prune them too severely. Since they come in a variety of sizes it is better to select a low-growing kind and let it have full development than to attempt to dehorn one of the large ones every year.

Forsythias also do well in the city area but are too large for most city gardens. They do not flower well when cut back severely year after year.

GROUND COVERS

The shadier portions of a city garden will look better with a good ground cover than in grass, and they will take much less time and effort. Even the most difficult of city backyards can be made reasonably attractive by paving the central portion with brick and then growing a good ground cover along the sides and at either end.

For the shadiest places wild ginger is excellent. Though this can be obtained in the trade, the local Missouri species and varieties are stronger-growing and will make a more effective ground cover. All the wild gingers like rich soil and the earth should be heavily mulched before one attempts to grow them.

Hardy Ivy is dependable both in shade and sun, particularly if one uses the new Balkan varieties introduced recently by the Garden, MBG "Bulgaria" and MBG "Rumania." These will take a year or so to establish but once this is accomplished they require almost no attention from year to year.

Periwinkle *(Vinca minor)*, commonly called myrtle in the United States, is also dependable, though it will not do so well in the city as it does in the suburbs. Bowles' variety, with its large blue flowers, is no harder to grow than the ordinary variety and is much more effective when it blossoms in the early spring.

The Herb Garden between the administration building and Tower Grove Avenue is rapidly becoming one of the most charming parts of the Garden. It was started several years ago by the St. Louis unit of the Herb Society of America, and the members have done all the work and paid for nearly all the materials used. Brick paths were laid out according to a design worked out by Miss Edith Mason. Various perennial and annual herbs have been set out and cared for during two sweltering summers. Recently the Garden contributed half a truck load of small boxwood bushes from its nursery at the Arboretum. Last fall the Herb Society organized a "Cooks' Tour" raising funds for this and other herb gardens around the city. Part of this money has been used in repairing Mr. Shaw's old entrance gate and the cast-iron fence which forms the east border of the herb garden, shutting it off from the street.

TREE FEEDING

AUGUST P. BEILMANN

In 1929 the first article on tree "feeding" or fertilization appeared in the Garden BULLETIN. The information and suggestions given in this and later articles on tree feeding have had wide acceptance, but resulted in complete exhaustion of the bulletins reporting the work.* Since interest in the subject appears just as keen and even more necessary today than it was some years ago, it seems desirable to reprint the latest article and to review any facts which might have come to light since.

We must feed a tree to prevent the slow starvation which results if a tree uses all of the available food within range of its roots. In the forest a layer of decomposing leaves adds plant food to the soil through a devious biological chain. On a lawn or along the curb a tree must exist on what food becomes available each year through the slow decomposition of the mineral soil. As such a tree grows its requirements increase and at the same time the root area is restricted by streets and walks. The soil being unable to supply the tree with more than the minimum requirements, the growth rate is much reduced; insects and diseases do more than the usual amount of harm; and eventually the tree dies—a victim of starvation.

The terms "tree feeding" and "tree fertilization" need some clarification. In the field of tree care they mean the same thing: replenishment of soil elements. All plants manufacture food from nitrogen, phosphorus, potash, lime, iron, and many other elements which occur in minor quantities in the soil, including boron, zinc, and manganese. These are carried to the leaves, through the roots and trunk, where, in the presence of sunlight and carbon dioxide, they are synthesized into living tissue. Feeding a tree, then, consists of adding those deficient elements in ways acceptable to the roots. This is commonly done by using commercial grades of nitrogen, phosphorus, potash, calcium, iron, and some of the lesser elements, to overcome the shortages indicated by either soil tests or field work or both.

Most of the experimental work on tree feeding at the Garden has centered on the large trees, many of which had reached maturity in the sixty or more years since they were set out. Some trees 150 years old were included, since they had successfully bridged the gap between the old prairie and encroaching civilization. To verify the effectiveness of the feeding formulas many smaller trees were used, but none of the work was done in nursery rows or

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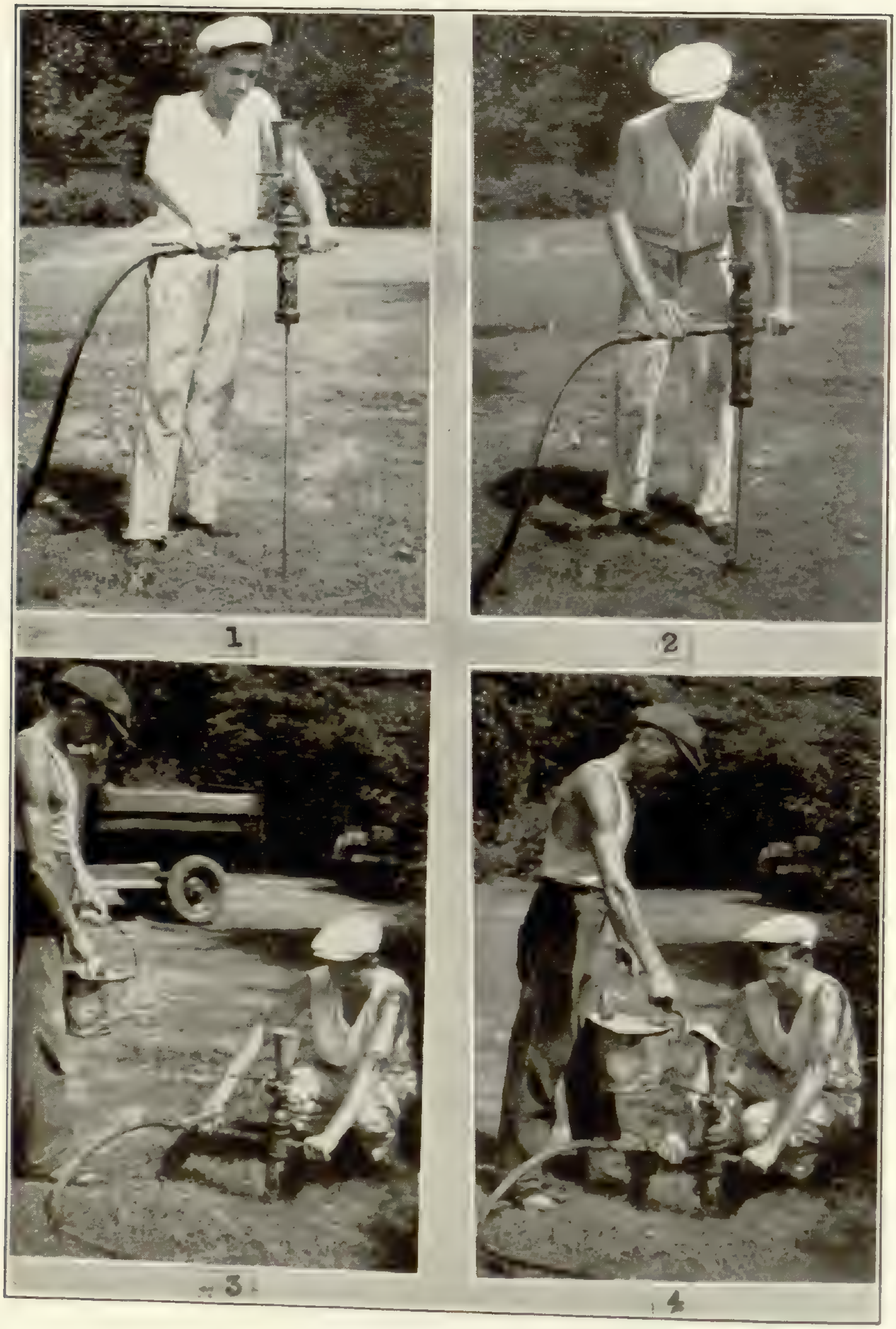
*(1) The feeding of shade and ornamental trees. Mo. Bot. Gard. Bull. Vol. 17, pp. 119–130. 1929; (2) How to feed a shade tree. Vol. 22, pp. 113–126. 1934; (3) Feeding the shade trees. Vol. 24, pp. 95–113. 1936; (4) Tree Feeding. Vol. 37, pp. 115–122. 1949.



PRESSURE GUN FEEDING

1. Pressure feeding gun in position to drill hole. 2. Half way. Depth of feeding can be controlled. 3. Hole drilled. Ready to charge cylinder with fertilizer. 4. Second charge of 1½ pounds being poured into gun.

pot cultures in the greenhouses. All efforts were directed toward stimulating trees in such a way that there could be no doubt about the effectiveness of the feeding program. For this reason very few check trees were used. It was also found more satisfactory to compare the growth during the five years preceding feeding with that after feeding than it was to locate identical trees which would serve as checks.

The soil within the Garden is of aeolian (wind-blown) origin, called loess, and classed as Muscatine Silt Loam. It has great depth, good water-holding capacity, and uniform texture to a depth of 30 inches where a "hard pan" is encountered. Although this soil is usually considered to be lacking in available phosphorus, additional phosphorus had no effect on tree growth. Only increased amounts of nitrogen stimulated the trees, and above a certain point that did not result in increased growth unless both phosphorus and potash were included in the fertilizer. Eventually the formula was established at 41 per cent nitrogen, and this was the only one in ten years of testing which gave predictable results. In time it became standardized as a 10-8-6 commercial fertilizer, containing 10 per cent of available nitrogen, 8 per cent phosphorus, and 6 per cent potash. Considerable work was done with the "minor" elements—zinc, boron, manganese, magnesium, etc., —but no measurable evidence indicated that they were needed in tree feeding, although their need in fertilizing field and truck crops is very well established.

There is some objection to the use of a "complete" food (one containing nitrogen, phosphorus, and potash) in every case. It is not unlikely that a soil containing adequate amounts of one of the important elements will be encountered. However, until satisfactory testing equipment is readily available it will be better to continue the "shotgun" method of using the complete food, in the hope of supplying the deficiencies. There is also less danger in using this type of tree food since the combination of the three elements will be less likely to "burn" than will a single salt. In addition, the use of just one or two elements may and often does accentuate the need for the missing portion of the formula.

The chemical fertilizers used in this work were those which were considered as immediately available to plants. No evidence appeared to indicate that fertilizers requiring a year or longer to become soluble were of special benefit. Objections have been raised to the use of these quick-acting materials; they have been likened to a "shot in the arm" which would leave a tree worse off after they leached away. That this is not the case is shown by a group of seven pin oaks *(Quercus palustris)* which after fourteen years were still growing eleven inches taller each year. Before feeding they had grown two inches taller and added one-tenth inch to their trunk diameter annually.

It has been stated that we should never "over-feed" a tree. This is a presumptious remark. Since we all arrived on the scene some 200 years after the destruction of the virgin forest, we can only guess at what should be a "normal" growth rate. If a shade tree grows 6–8 inches in height annually it is in no immediate danger of starving; but it would not be hard to find specimens of the same tree growing four times as fast under certain conditions. If the growth of the branch tips indicates an increase of less than 6 inches a year, the tree is considered in need of additional food. This does not apply to dwarf trees or some horticultural varieties known to grow very slowly. It does include nearly all of the trees ordinarily used on streets or lawns as shade trees.

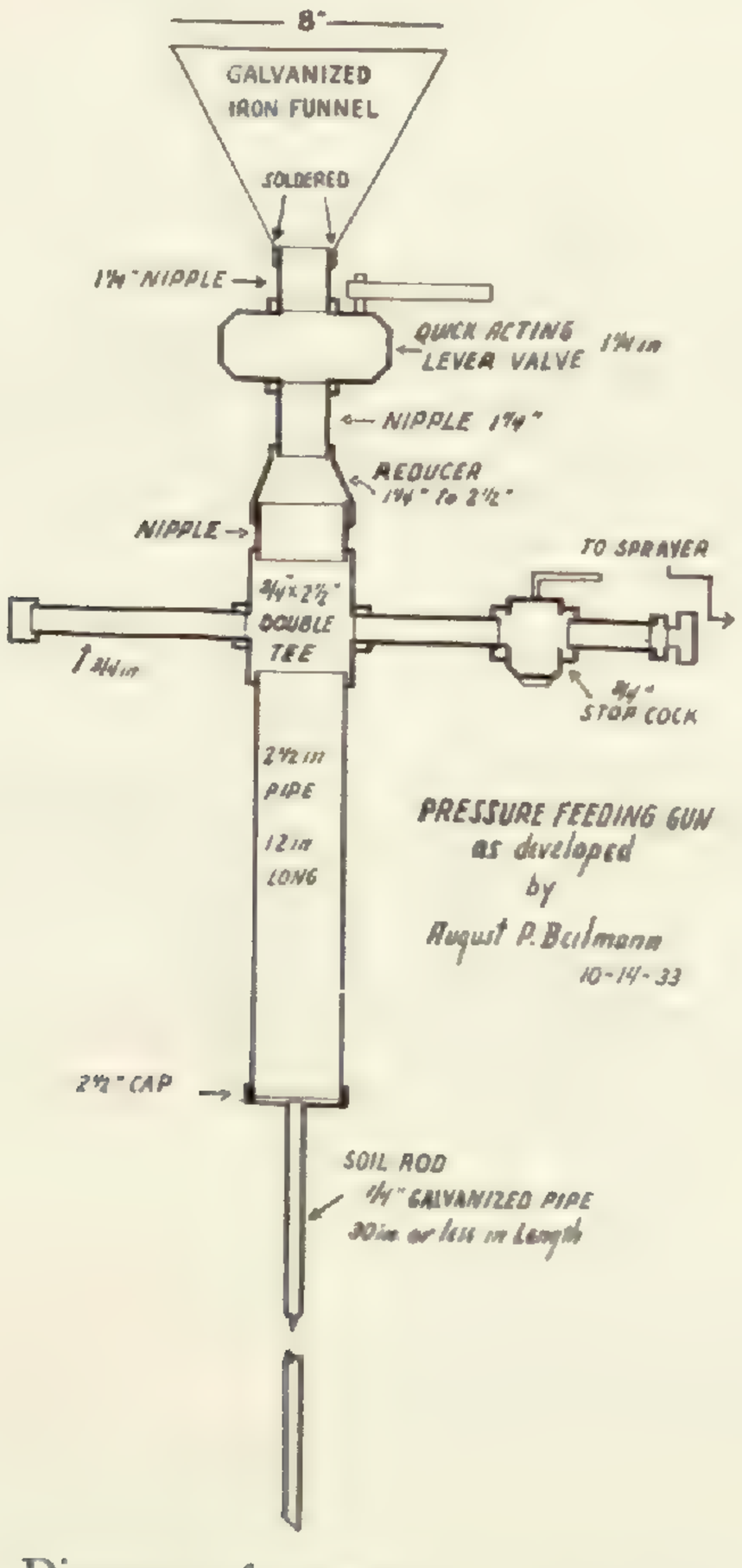
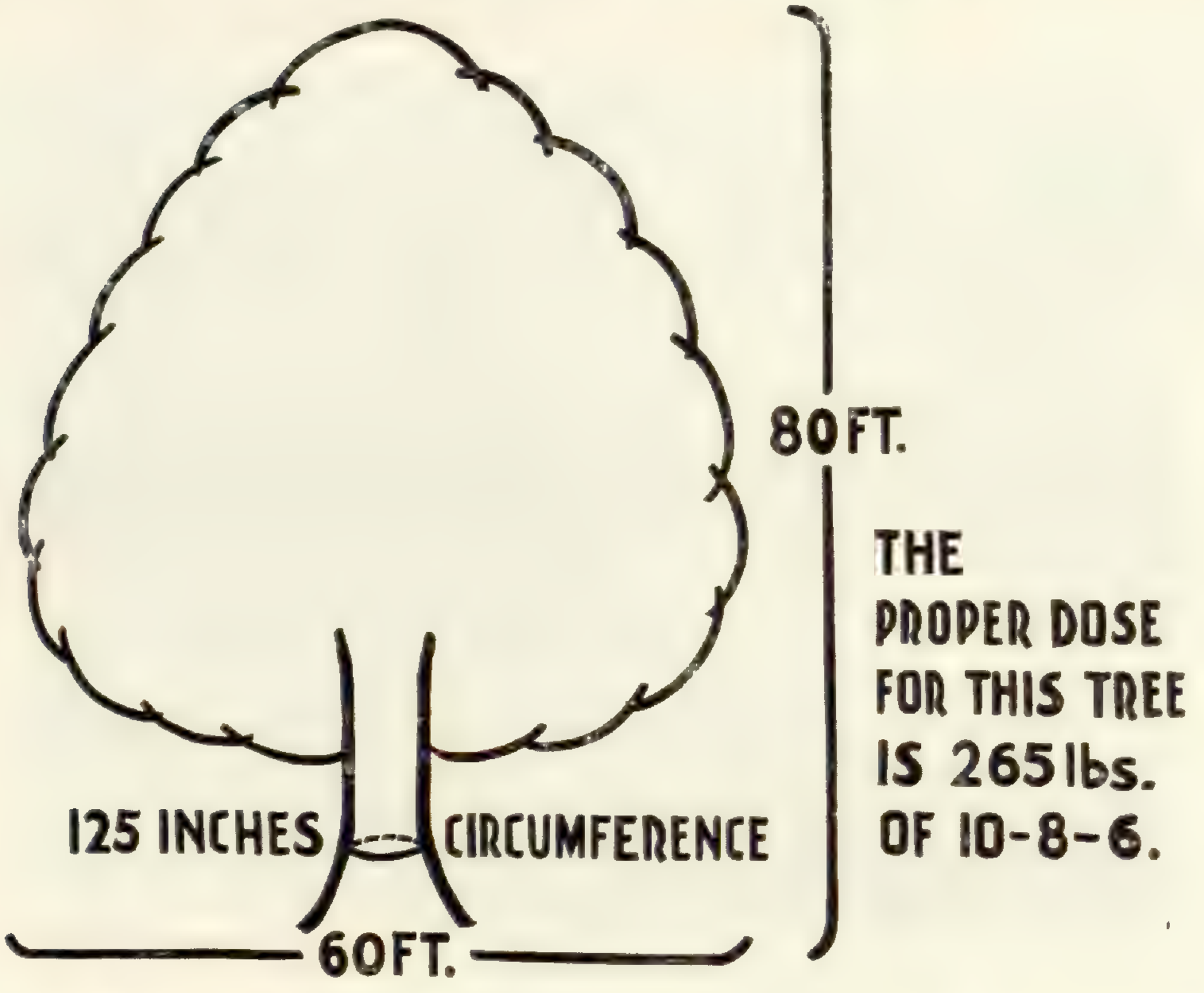


Diagram of pressure feeding gun

There are two major ways of adding fertilizers to the soil. One is to punch holes with a crowbar and fill them with the proper mixture. The other is to drill holes with a soil auger or with hydraulic pressure. Crowbar holes are made under the branch tips and driven from 12–30 inches deep depending upon the depth of the soil. If a single row of holes will not hold all the fertilizer needed another row is made inside or outside of the first. Sometimes it is necessary to perforate the whole area sheltered by the branches

Making holes around tree by punch-bar method

Placing trowel of food in punch-bar hole



How fertilizer dosage is calculated: to the height in feet (80), add the branch spread in feet (60) and the trunk circumference in inches (125). The sum is the amount of 10-8-6 fertilizer needed.

to obtain adequate space. Usually the holes are about 30 inches apart and the rows spaced about 36 inches. If mechanical means are used to drill the holes, the same power is generally used to force the diffusion of the fertilizer through the soil. The home-owner can use the crowbar successfully, while power equipment is usually restricted to professional tree men. A method and the equipment required to do this work with a power sprayer is illustrated. The advantages of the power tools, aside from reducing the heavy manual labor of punching holes, are very real. Either hydraulic or pneumatic pressure used as a carrier will prevent the formation of pockets of fertilizer often attendant upon the use of the crowbar. In the Middle West there are definite advantages in the use of water pressure to carry the fertilizer under ground and force its distribution through many cubic feet of soil. Usually the late summers are dry, and fertilizers require some water for the most effective use. For this reason spring feeding is to be recommended, since trees have a longer season in which to tap this new food supply.

After it has been established that a tree needs more food, the formula has been selected (the 10-8-6 has been generally used), and the method of appli-

Dense forest type

Use ½ calculated dose.

Open-forest, street or lawn type

Use ⅔ calculated dose.

Specimen type

Use full amount.

cation has been decided, it bcomes necessary to inquire about the dose per tree. The following three figures have been used to calculate the amount of food to apply to the soil about any particular tree. We have added the height of a tree in feet to the branch spread in feet, and to this added the circumference of the lower part of the trunk in inches. The total has been interpreted as the number of pounds of 10-8-6 fertilizer needed for that tree. This is admittedly a large amount of fertilizer, but it must be remembered that with a starving tree having a branch spread of 60 feet or over we are working with $\frac{1}{16}$ of an acre. If we hope to restore the fertility to a depth of 30 inches (often the depth of root penetration) we are dealing with the equivalent of the top soil of two acres. Field crops often accept 500 pounds of fertilizer per acre and produce prize-winning harvests.

SUMMARY

The need to feed trees is generally accepted since it is not possible to grow either trees or a bumper field crop on the same soil without an attempt to maintain fertility.

Of the many formulas tried during ten years, the 10-8-6 (containing 10 per cent nitrogen, 8 per cent phosphorus, 6 per cent potash) has given the most dependable results.

Fertilizers must be placed within the root area—usually considered to be beneath the branches.

Tree feeding should be done in spring while the soil contains ample water.

Either the crowbar or a mechanical means of placing the food underground may be used. The crowbar pockets permit maximum concentrations but perhaps favor "burning" in very dry seasons.

Follow the dosage suggested for starving trees and reduce the amount if the growth rate is only a little below normal.

Recently, "foliar feeding" solutions, which have quite commonly been used on house plants, have become available for shade and lawn trees. This method consists of placing small quantities of soluble nutrients directly on the leaves where they are quickly absorbed. Fertilizers added to the soil usually require some weeks before there is evidence of assimilation, but feeding through the foliage gives very quick results. The improvement can generally be observed as a deepening of color—a change from a yellow-green to a darker blue-green. Foliar feeding has been used experimentally at the Arboretum on rooted cuttings, ornamental materials, and forest trees. The results have been excellent in all cases, especially with smaller plants. However, shade and forest trees require such quantity that a large hydraulic sprayer must be used in order to give a thorough drenching.

BOOK REVIEW:—

Handbook of Plants of the Colorado Front Range. By William A. Weber. 232 pages. University of Colorado Press, Boulder, Colo., 1953. $5.00.

The Colorado Front Range is that part of the Rocky Mountains nearest to St. Louis and, while still nearly a thousand miles away, is accordingly of special interest to residents of the St. Louis area. The Front Range extends roughly from Pikes Peak northward to Rocky Mountain National Park. It is a national recreation area of the first magnitude. Not the least of its attractions is its flora, which includes some 1300 species of ferns, conifers and flowering plants. Many of the last occur in great abundance in high altitude meadows, coloring these with brilliant reds, yellows and blues. Others are rarities found only occasionally in out-of-the-way spots, but none the less attractive and charming. As the author of "Handbook of Plants of the Colorado Front Range" remarks, all of this "vegetation means more to us . . . when we can call some of the plants by name."

The nature of Professor Weber's book is much better indicated by its subtitle than by its title, for it is essentially only a volume of "keys for the identification of ferns, conifers, and flowering plants." As such it should be a useful field book. The keys, which have been field-tested for years and should accordingly be pretty well error-free, cover the whole vascular flora of the Front Range. Despite its over 200 pages the book would still add little weight to a knapsack, a real consideration in the Rockies. There is an

excellent glossary well illustrated with over three score clearly drawn figures. The main portion of the book is prefaced by helpful paragraphs on the plant zones of the area, the use of keys, the structure of plants, directions for collecting plant specimens, etc.

But it is only fair to remark that the author has written his book for those who are "willing to make a serious effort." He has not shunned the use of technical terms, and anyone unfamiliar with them who would use his book must make the not inconsiderable effort of learning a fairly large new vocabulary. Again, as any botanist will affirm, one cannot always be sure of the determination of a plant from a key; there are too many possible slips. The proof of the key is the description, or better, the comparison with an illustration or an authentically named plant specimen. In this book there are no descriptions and no illustrations of any of the plants. However much the book may help one to find a name for his plant, he will want other means of confirmation, as well as other information such as can only be found in the more pretentious floras.

Comparison with F. Schuyler Mathews' very successful 'Fieldbook of American Wildflowers' is inevitable. Mathews was able to include about 900 species, each with an adequate description and a very adequate illustration. True, he included only keys to the families, but he supplied a great deal of habitat information and plant lore, and still his book bulked much less than Professor Weber's. Had Mathews cut corners by paring his descriptions and especially the paragraphs of additional information he could have included half again as many species and at least generic keys. Would not something of this nature solve the problem of a pocket flora of an area no larger than the Front Range?—G. B. Van Schaack

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NOTES

Mr. Louis G. Brenner, of the Arboretum staff, has just been made one of the Board of Directors of the Missouri Quail Hunters' Association.

Recent visitors to the Garden library and herbarium include: Dr. P. K. Koh, of Kyongjuk University, Taegu, Korea; Dr. S. C. Choi, of Chunam University, Kwangju, Korea; Mr. Ralph Emons, of the Antibiotic Division, Chas. Pfizer & Co., Brooklyn, N. Y.; Dr. Tien-ding Chang, of the Taiwan Research Institute, Taipei, Formosa; Prof. Taizo Inokuma, of Institute of Forest Botany, University of Tokyo, Japan.

Last year one of the Garden's guest investigators was a young man from Honduras, Sr. Antonio Molina R. Since his return to the Escuela Agricola Panamericana at Tegucigalpa in Honduras he has published part of the work he did up here on a Guggenheim Fellowship. It is a technical monograph of a group of plants from the New World tropics and appeared in the

last number of *Ceiba* under the title: "Revision de las Especies de Cephalodes de Mexico, Centro America y las Antilles."

Up until mid-January Mr. Shaw's Old Residence "Tower Grove" has been open to visitors every afternoon from one to four, with ladies from the Federated Women's Clubs serving as guides. It was then closed for one week for cleaning and minor repairs. The hardwood floor of the front parlor has been refinished and Mr. Shaw's old office at the rear of the building is being replastered and repainted. Since the building was re-opened to the public in November more than 2000 visitors have registered in the guest-book. They came from thirty-five states and from twelve foreign countries. Week-day crowds dwindled when the chrysanthemum show was closed, but the Sunday afternoon crowds have given the guides all the visitors they could handle efficiently. Several hundred dollars have come in as voluntary contributions to the restoration fund, and pieces of furniture of the same period as the house have been contributed by three families.

One of the nice things about having young people trained in Botany at the Missouri Botanical Garden is that after they have gone out and made names for themselves in the world they frequently come back and pay us extended visits, using our library and conferring with us about various problems. We learn from them and they learn from us, and the general atmosphere is rather like having the grown-up children in the family come home for Christmas. These remarks were brought to mind by Dr. Charles Heiser, now of the University of Indiana, who has been working in the herbarium and library for the past several weeks. Dr. Heiser is a St. Louis boy who took his Master's degree in the Henry Shaw School of Botany of Washington University, doing a good deal of his work at the Garden with the late Dr. Greenmann, Dr. Woodson, and Dr. Anderson. He has since become the world's authority on the wild and cultivated sunflowers and on all kinds of red peppers. This year he has had a Guggenheim Fellowship and has been studying cultivated peppers and their wild relatives at the Inter-American Agricultural Institute at Turrialba, Costa Rica.

Immediately after the Christmas holidays the Garden received a brief visit from George Freytag and his wife. Mr. Freytag is one of the graduate students of the Henry Shaw School of Botany of Washington University and is carrying on his work under Dr. Anderson's general direction. Several years ago he took up a very neglected problem, the classification of the multitudinous varieties of the kidney bean. His work came to the attention of the Rockefeller Foundation group which is cooperating with the Mexican government. Since last June he has been a member of the Mexican-American plant breeding team in Mexico City, though still a graduate student.

THE MISSOURI BOTANICAL GARDEN

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John S. Lehmann ..... Acting Director
Edgar Anderson ..... Assistant Director
Leicester B. Faust ..... Executive Assistant
Carroll W. Dodge ..... Mycologist
Robert E. Woodson, Jr. ..... Curator of Herbarium
Henry N. Andrews ..... Paleobotanist
Rolla M. Tryon ..... Assistant Curator of Herbarium
Hugh C. Cutler ..... Curator Museum of Economic Plants
Robert J. Gillespie ..... Research Horticulturist
John D. Dwyer ..... Research Associate
George B. Van Schaack ..... Honorary Curator of Grasses
Julian A. Steyermark ..... Honorary Research Associate
Nell C. Horner ..... Librarian and Editor
Edna Mepham ..... Assistant Librarian
Ida M. Kohl ..... Assistant Librarian
Gerald Ulrici ..... Business Manager
George H. Pring ..... Superintendent
Paul A. Kohl ..... Floriculturist
Ladislaus Cutak ..... Horticulturist in charge of Conservatories
Frederick G. Meyer ..... Dendrologist
Kenneth A. Smith ..... Engineer
August P. Beilmann ..... Manager of the Arboretum, Gray Summit
Louis G. Brenner ..... Assistant Manager of the Arboretum
G. R. Lowry ..... In charge of Orchids

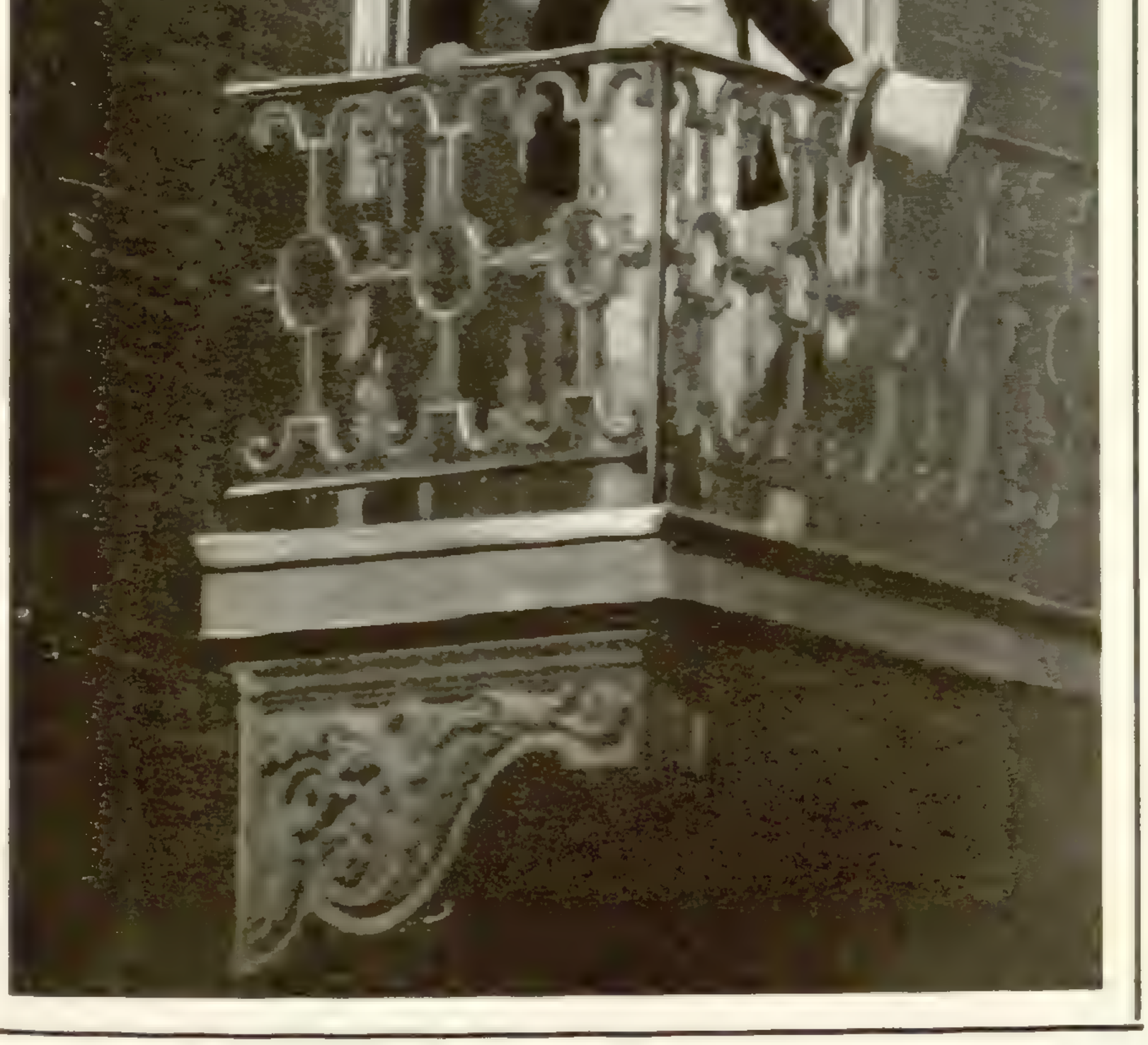
SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden carries on the garden established by Henry Shaw over a century ago at "Tower Grove," his country home. It is a private institution with no public support from city or state. The old stone walls and cast-iron fences, the Linnean House, the Museum, the Mausoleum and the "Old Residence" all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's Day and Christmas) from 9:00 a. m. until 7:00 p. m., April to November, and until 6:00 p. m., November to April, though the greenhouses close at 5:00 p. m. Tower Grove, itself, Mr. Shaw's old residence, is open from 1 until 4. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line. The Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m, but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., opposite the junction of routes 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN



SPECIAL HITCHCOCK NUMBER

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What It Is and What It Does

Volume XLII February, 1954 Number 2

COVER: Mr. Henry Shaw on the balcony of his town house. At the time this picture was taken the house stood on the corner of Seventh and Locust streets which is now downtown St. Louis. After his death the house was taken down and re-erected at 2315 Tower Grove Avenue where it now forms the north wing of the present Administration Building.

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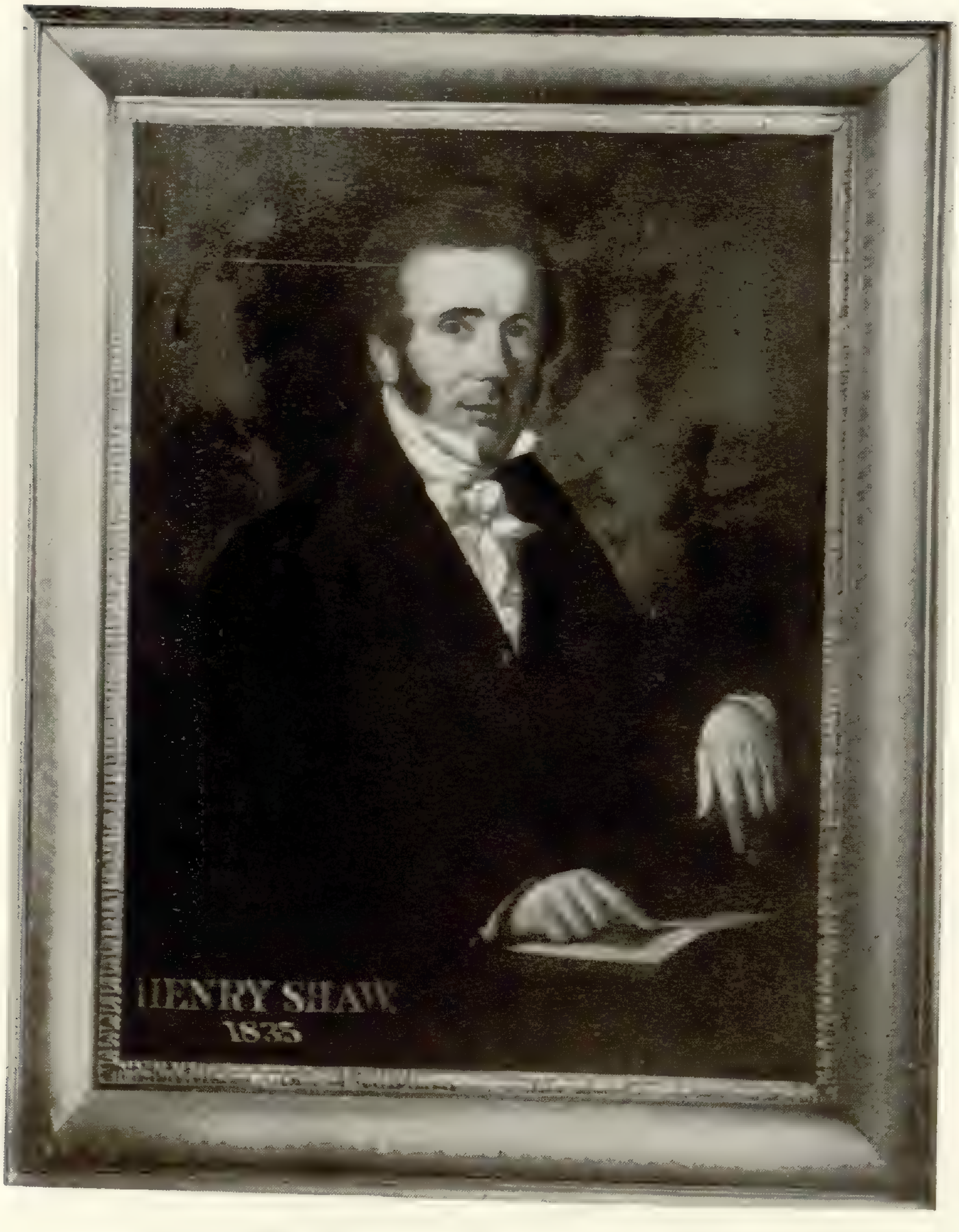
Please: Do not discard a copy of the Bulletin. If you have no further use for yours pass it along to a friend or return it to the Garden. Return postage will be guaranteed.

THE HITCHCOCK LEGACY

It is appropriate that a number of the BULLETIN devoted to the history and functions of the Garden should bear the Hitchcock name. There has always been a Hitchcock on the Board of Trustees since it first began operations in accordance with Mr. Shaw's will. Henry Hitchcock (the grandfather of the present member of the board) was a friend of Henry Shaw's and was on that first board. He was succeeded by his son, George Collier Hitchcock, affectionately known to many St. Louisans as "the Judge" and for many years the president of the Board of Trustees of the Missouri Botanical Garden. In his kindly way he left a bequest to the Garden to be used wherever it might be needed the most. This fund has provided for the color plates and additional illustrations for this number of the BULLETIN.



Henry Shaw at the age of thirty-five

This portrait shows him at about the time that he first conceived the idea of building up his country estate into a garden for the public to enjoy.

Missouri Botanical Garden Bulletin

Vol. XLII FEBRUARY, 1954 No. 2

THE MISSOURI BOTANICAL GARDEN

WHAT IT IS AND WHAT IT DOES

What is a botanical garden? It looks more or less like a park; why not call it a park and be done with it? Well, primarily a botanical garden is a center of understanding of plants; its business is to interpret plants to the community. Notice that word, UNDERSTANDING; it is the key-word. Understanding springs not from the head alone, like knowledge, nor from the heart alone, like love. It is something more than both of these put together. An understanding of plants is an appreciation of them, a knowledge of their kinds, their likes and dislikes, their role in the history of mankind. It is a liking for them, a joy in their infinite variety, a realization of their effect on the human spirit. It is the primary job of the botanical garden to increase this understanding, to promote a love of plants, an interest in the local flora, to serve as a center where like-minded people in the community can meet each other and work together with plants, to find out things about plants which were previously unknown, to function as an organized distribution center for those facts already known, to display plants so that their wonder and their beauty and their usefulness will be brought to the attention of young and old, to be, in other words, a go-between for plants and people.

All of this sounds pretty high-flown but it is true just the same and it needs to be understood. Perhaps it might be a good idea to show by examples the way an understanding of plants produces tangible results at a botanical garden. Take Mr. Pring's creation of the yellow water-lily, "St. Louis." Since boyhood, Mr. Pring has been associated with two botanical gardens, the Royal Botanic Gardens at Kew, and the Missouri Botanical Garden in St. Louis. At both of them he has grown and studied water-lilies. He is familiar with their classification, with all the literature about them, with their growing and propagating, and with their use as cut flowers and as tubers and seeds. In other words, he understands them. He knew enough about them in the first place to realize that there were opportunities for interbreeding the tropical day-bloomers already on the market and producing superlative new varieties. This he did, and this he might have done had he

been at a park instead of a botanical garden. But because he was at a botanical garden, it was natural for him to go on with the next step. Knowing the scientific as well as the horticultural literature, familiar with the dried specimens of water-lilies in the herbarium (which are meaningless things to the ordinary gardener), he knew there were other species in Africa which had never been introduced to gardens. By every possible route he sought to get hold of these wild water-lilies, particularly the yellow-flowered ones. Thanks to his persistence, thanks to his connections with other botanical gardens, he eventually got two species of these wild yellow African lilies and by using them he has produced a whole group of beautiful new varieties. This is the kind of thing which happens naturally at any well-run botanical garden; it can occur elsewhere, but it is much less likely to.

Let us drive the point home with one more example. Dr. Anderson, too, has worked since boyhood in a succession of botanical gardens, Beal Botanic Garden, Arnold Arboretum, John Innes Horticultural Institution, Missouri Botanical Garden. When he set out to find broad-leaved evergreen plants which would bring winter beauty to our midwestern gardens he had acquired enough understanding to know where to look. With his botanical-garden background he knew that to find more adaptable strains of tender plants one goes to that part of their range having a climate most like our own. With his botanical-garden background he knew that if boxwood and ivy are to succeed in the Middle West we must get strains of them, not as we previously did from England and Germany, but from those parts of Europe with a "middle-western" climate—in other words, from southern Russia and the northern Balkans. With his botanical-garden connections he not only got to those regions but got in touch with local botanists, gardeners, and foresters, who aided him in bringing back Balkan strains of various broad-leaved evergreens. One of the results of his trip is the Bulgarian Ivy which is transforming the winter aspect of the Missouri Botanical Garden and will play an important role in middle-western gardens as it becomes better known. This again is something which might just possibly have been done in a park or a nursery or a department of botany, but it is the sort of accomplishment one expects from a botanical garden.

It is a good idea to begin this story of the Missouri Botanical Garden with a discussion of botanical gardens and their place in the community, because it was out of just such discussions that the Garden came into being a century ago. Mr. Henry Shaw, an able young Englishman with good business connections and $10,000 to invest, settled down in St. Louis in the early nineteenth century and made a small fortune. A trip back to England had given him the idea of developing his estate just outside St. Louis for the benefit of the community as well as for his own delight. His friend of many

years, Dr. George Engelmann, a distinguished surgeon, had spent his formative years in German universities and was one of the ablest botanists of his day. Germany, then as now, had more and better botanical gardens than any other part of the world, and Dr. Engelmann knew from experience what a botanical garden could do for a community. Year after year he urged Mr. Shaw to create and leave for St. Louis not merely a park, but a park *and* a botanical garden. Eventually Sir Joseph Hooker, the Director of the Royal Gardens at Kew, came to the United States on an extended tour and Dr. Engelmann saw his chance. In letters which can still be read he planned his campaign. Sir Joseph came to St. Louis by way of Boston and Harvard where he was the guest of Asa Gray. Dr. Engelmann wrote Gray, who explained the whole situation to Sir Joseph, and when the latter came to St. Louis and was entertained by Mr. Shaw, he emphasized what a superlative role a good botanical garden could play in the developing Middle West. Mr. Shaw was swung over by Sir Joseph's opinion, and from then until the day of his death his first interest was the botanical garden he would leave behind him.

Modestly Mr. Shaw decided that the new garden should not bear his own name but should be designated as the "Missouri Botanical Garden." While this was very nice of him there are times when those of us who live and work in his botanical garden wish that he had not done so. The place was called "Shaw's Garden" in his lifetime, and Shaw's Garden it remains to this day in popular speech, legal name to the contrary notwithstanding. It is not always convenient having two names, the legal one and the popular one. There has to be a double listing in the telephone book, and eventually we may have to use it on our letter-head for the sake of visitors from out of town. Several of us on the staff had our first encounter with the double name when we came to take up positions at the Garden. We landed at the Union Station or the airport and asked to be directed to the Missouri Botanical Garden. Invariably, the reply came that there was no such place in St. Louis, or at least not one generally known, and it was only after persistent questioning that the identity of "Shaw's Garden" and the "Missouri Botanical Garden" was cleared up.

It is kind of nice that St. Louis remembers Mr. Shaw in this personal way in spite of his own efforts to be politely anonymous. One of the amusing results is when the occasional citizen who sees Mr. Shaw's original inscription over the front gate writes an irate letter to the newspaper complaining of our disrespect to Mr. Shaw's memory.

(Continued on page 36)

Two views in the central part of the Garden in the Nineties. It required about as many gardeners to take care of the carpet bedding shown in these two views as are now available for the entire Garden.

The Main Gate in the Nineties

The Garden was then at the edge of the city. As the condition of the street suggests there were then some problems we do not have to face today.

The cactus collection was moved out of doors for the summer. Gardeners were cheap in those days and good ones were easy to find.

The Main Gate seen from the inside

Orchids arrive by truck

Spring bulbs are whisked into the show in a trailer

The New and the Old in Flower Shows

Motorized equipment saves man hours in setting up the big flower shows. Orchids come in from the greenhouses at Gray Summit in specially designed boxes and trays which fit in the big panel truck. A little trailer moves spring bulbs and other small flowers in quantity directly into the floral display house.

Styles in hats come and go, but every year when the big "mum" show is taken down the ladies of the Book-Flower Guild meet at the Garden to prepare bouquets for distribution to the hospitals.

The Book-Flower Guild in 1907

Interior of the Auditorium in the Museum

This was the building erected under Henry Shaw's personal supervision in 1859 when he definitely set out to found a botanical garden. It served as library, herbarium, and administrative center for the Garden as well as a Museum for the education of the general public. The year 1954 finds it quite as actively in use and for a variety of purposes. It is a regular meeting place for several of the horticultural groups in the city such as the Herb Society, the Orchid Society, and the Henry Shaw Cactus Society. A series of semi-permanent exhibits are being installed as time and funds are available. It is now officially a Museum of Economic Plants and is the center for the research activities of Dr. Cutler and Dr. Anderson and their students and associates.

In carrying out Mr. Shaw's plans the Garden does many things. In the course of the last twelve months, for instance, the Garden has:

1. Brought in bulbs of new snowdrops from Turkey by airmail.
2. X-rayed seeds of tobacco.
3. Reduced useless weed trees and brush to productive mulch with the use of power machinery.
4. Named and introduced several new hybrid orchids.
5. Installed new boilers in the power house.
6. Sold over 23,000 colored postcards.
7. Made several thousand ivy cuttings.
8. Filled in scores of small gullies at the Arboretum with river soil.
9. Organized and conducted a class in plant breeding for amateurs.
10. Brought back new cacti from the Southwest.

The list could go on indefinitely. Obviously, if we are going to get anything like a quick bird's-eye view of what goes on at the Garden we had better group these various activities under a few main headings. Most of them will fall under one or another of the following five: Publication, Research, Instruction, Collection, and Exhibition, which are easy to keep in mind by the initials P R I C E.

PUBLICATION:—

The Garden has several publications. This BULLETIN which you are reading is one of them, and it is published ten times a year. It serves several purposes, telling the public about what is going on at the Garden, passing on useful information to gardeners, reporting botanical facts of general interest. The material in it is not copyrighted, and permission to reprint in St. Louis or elsewhere is always freely granted. At the moment of writing, for instance, the magazine called *Wild Flower* is devoting some of its pages for several numbers to reprinting the articles on "Missouri Wildflowers" which came out in the BULLETIN last year. In this way some of the BULLETIN articles have reached tens of thousands of readers, a few of them hundreds of thousands.

The other periodical produced at the Garden is of quite a different nature. It is called the ANNALS OF THE MISSOURI BOTANICAL GARDEN, or just "THE ANNALS" for short, and it comes out in conservative dark paper covers four times a year. It is written by the scientists at the Garden, or by students under their direction, and it reports the scientific discoveries being made here. Through a world-wide circulation it is known to professional botanists everywhere. An occasional St. Louisan straying into the library at Kew, or visiting the Linlithgow Library in New Delhi, or stopping off in Java, has been so surprised to find the current numbers of the ANNALS prominently displayed in such a far-off place that he has sent us a postcard

about it or called us up on the telephone on his return. Those who do scientific work at the Garden get so used to having world-wide reputations that they are rather surprised that their non-scientific friends and neighbors make so much of it. Perhaps therefore we had better stress the fact that this is indeed so; that Dr. Dodge's work on Lichens and Fungi is known all over the world; that Lad Cutak is in touch with Cacti and Succulent specialists in Mexico, South Africa, and Germany; that Dr. Woodson gets as much mail from outside the United States as from within its borders.

The BULLETIN and the ANNALS come out regularly. At irregular intervals the Garden also publishes books and pamphlets to meet particular demands—guides to the Garden, water-lily catalogues, Dr. Steyermark's illustrated flora of the state, a brochure on the history and development of the quinine industry, etc. Our most ambitious undertaking is the "Flora of Panama", an illustrated technical guide to the plants of that important area. It was begun in 1938 under the editorship of Dr. Woodson. Approximately one-third of the "Flora" has now been published, a volume or a portion of a volume at a time. Although dealing specifically with the flora of Panama, it is useful over a much wider area. Throughout Central America those portions which have appeared are now in daily use in various laboratories from Honduras to Colombia.

RESEARCH:—

Research, the finding out of new truths, the adding to the sum of human knowledge, is one of the responsibilities of any first-rate botanical garden, and Mr. Shaw stipulated in his will that it was to be carried on.

There are a number of indirect benefits to a research program. It keeps the staff on their toes intellectually. It keeps their minds awake and flexible and interested in new developments. It puts them in touch with fellow-scholars all over the world, a very helpful thing for a botanical garden in more than one way. Somewhat over a year ago, for example, it became apparent that the snowdrop collection, started twenty-five years ago by Mr. Kohl, was continuing to give a fine display with very little encouragement and that it might be a good thing for the Garden to build up as complete a collection as possible. We immediately got in touch with Col. Stern of the Royal Horticultural Society, since several of our staff knew that he was engaged in monographing the snowdrops of the world. By similar contacts we enlisted the aid of a young Turkish botanist, a Scotch collector of rock-garden bulbs, Mr. Edgar Denison of Kirkwood, and Mrs. J. Norman Henry of Gladwyne, Pennsylvania (whose garden just outside of Philadelphia is a botanical and horticultural treasure-house). With their help, promptly and freely given, we have quickly assembled the finest collection of snowdrops in the New World. This was possible because we were dealing with fellow

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Mrs. Lowry weighs the formula for the nutrient solution

The Story of the Queen's Bouquet

Every year the Garden presents an orchid bouquet of fantastic beauty to the new Queen at the Veiled Prophet's ball. The flowers are all grown in the Garden's orchid greenhouses and many of them have been bred in the Garden's laboratories. The tiny seeds, like a fine gray meal, are planted on scientifically prepared gelatin and are carried through their early stages as little "babies" in sealed glass flasks. When the plants are a few inches high they are transplanted to flower pots and after several years they are of flowering size.

Transplanting orchid seedlings to a fresh flask of medium. This practice adds considerably to their vigor and development.

Getting the blooms ready for the bouquet. The bouquet itself is shown on page 45.

When the flowers are harvested a glass tube of fresh water is sealed over the cut ends of each stem and the tubes packed in shredded tissue paper. Delivery trucks (note the truck in the background) drive right into the potting shed of the orchid house.

Dr. Woodson and Mr. Freytag turn to one of the old folios in the library to answer a question about Magnolias.

As a training center for young botanists the Garden has had a national and international reputation for over half a century. In a survey of those who received their training here, conducted a few years ago, it was found that our graduates were now scattered over thirty-five states, mostly as professors of botany or microbiology. Some of them are in foreign countries. At the moment there is one in Finland,

one in Mexico, two in Honduras, one in Costa Rica, one in Colombia, two in India, one in Formosa, one in Burma, and one in New Zealand. Some of these are Americans who have gone abroad; others are foreigners who came here for their scientific training and then returned home.

Almost as important has been the Garden's role as a center for botanists from other institutions. The good library, the agreeable working conditions, the convenience of St. Louis as a railroad and highway center have all contributed to this development. Some come for a few hours; some spend a day or two; an occasional visitor stays and works for a month or more. They are one of the pleasant features of scientific life at the Garden, and scarcely a week goes by without having at least one of these informal "scholars-in-residence."

Dr. Duggar (fourth from the left) and a group of his students

scholars to whom cooperation in scholarship was taken for granted. We supplied the young Turk with railroad and bus fare to do the collecting and sent him useful literature in return; we collected American bulbs and forwarded them to the Scotchman; but it was the camaraderie of scholarship which made the whole enterprise go forward promptly and smoothly.

The direction which research work at the Garden has taken has varied with the times. Dr. Engelmann had been a leader in exploring and naming the flora of the developing West, and work in this field continued at the Garden long after his death. For twenty years, under the leadership of Dr. Moore[1] and Dr. Duggar[2], the laboratories at the Garden were a center for studying the physiology of fungi. Thirty years ago it was frequently difficult to justify to inquiring St. Louisians the nature of this research work. Fungi were being grown and studied; papers which made no sense to the ordinary intelligent gardener were being produced. Visitors always took for granted that this work was an attempt to learn how to control plant disease and were sometimes horrified to learn that the scientists were not particularly helpful at recommending sprays or, worse than that, did not always recognize a fairly well-known plant disease. Twenty years later it is easier to explain what these scientists were up to. The world has changed, and Dr. Moore's and Dr. Duggar's laboratory is one of the things which changed it. These men and their students were studying the physiology of fungi not just to save the nation's potato crop or to help keep the rust off carnations; they were working on the very frontiers of knowledge. What they were getting at was what we might call the home life of the fungi; how they live, what kinds of chemicals they need for life and what they do with these substances when they get them into their systems. These pioneers had to learn the hard way, by trial and error, how to cultivate these finicky plants; today it is done on a factory scale. It was pioneering work—the kind of pioneering which led to our modern understanding of antibiotics, to the various technical uses of fungi in chemical engineering. It is significant that today, long after his formal retirement, Dr. Duggar is on the staff of Lederle Laboratories and that he took the lead in the commercial development of aureomycin.

No work on antibiotics is being done at the Garden today. Government laboratories and private industry now push such studies forward at an ever-increasing scale. It is the function of such small independent laboratories as ours to pioneer, to develop unknown (or for that matter forgotten) fields until there are enough significant facts brought together to be of some purpose, either in understanding the world we live in, or for using its various features for man's benefit. The Garden is still pioneering in research. It

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[1] *Director Emeritus* of the Missouri Botanical Garden.
[2] Consulting Mycologist, Lederle Laboratories, Pearl River, New York.

Typical Day-blooming Water-lilies

(ST. LOUIS, WILD ROSE AND SHELL-PINK)

Annual Chrysanthemum Show in the Floral Display House

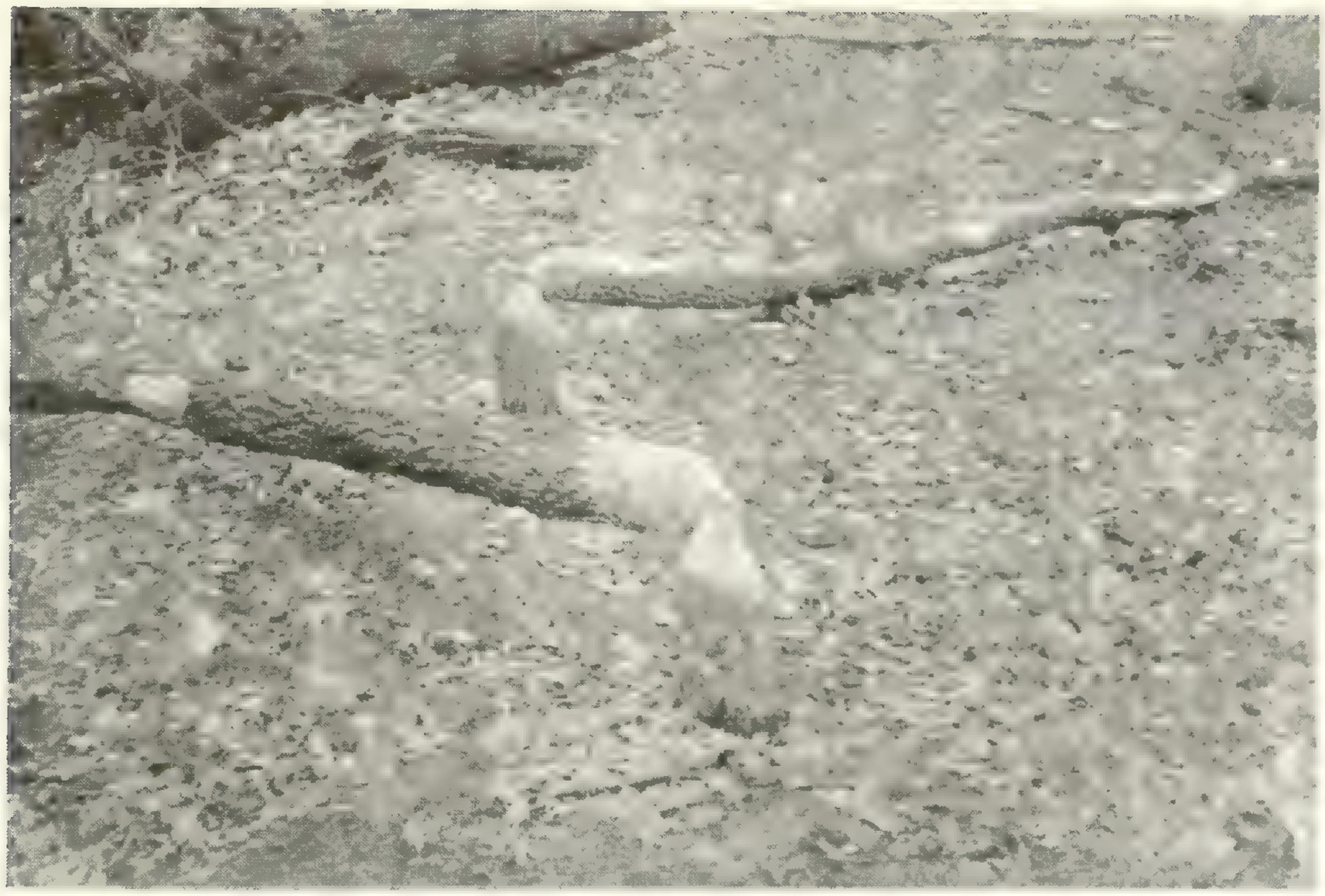
would be as hard to explain today the value of Dr. Anderson's current analyses of hybridization as it would have been twenty years ago to make Dr. Duggar's efforts generally intelligible. Just as the visitor of those days was so certain that Dr. Duggar must be learning how to control plant diseases that he could seldom get into his head any notion of the far larger program under way, so today those who learn a little something about Dr. Anderson's work are equally certain that he must be trying to breed a better kind of corn or a more handsome sunflower. Dr. Duggar, it is true, was a very knowledgeable man and frequently of direct help in a disease-control program. Dr. Anderson, likewise, is closely associated with various commercial corn-breeders but this is just incidental to a far wider research program.

The research carried on by the Garden is by no means limited to the laboratories and herbarium in the city garden. As it has developed, the Garden's Arboretum at Gray Summit has become more and more completely a research institution. The land was acquired when the smoke nuisance was so bad in St. Louis that it had become virtually impossible to operate a decent botanical garden here. Land was purchased well outside the metropolitan area and a new range of orchid greenhouses was soon constructed outside the smoke zone. It then seemed likely that before long it might be necessary to move most, if not all, of the Garden outside the polluted area. Fortunately, thanks to the efforts of a few determined citizens, smoke control in St. Louis became a reality and gardening is now no more difficult in St. Louis than in the midst of any other large metropolitan area. The Arboretum therefore has been devoted largely to those features which are difficult or impossible to develop in the middle of a large city. There are wild-flower reservations, meadows, and woodlands. There is a pinetum; the air of St. Louis is not even yet clear enough for evergreens to do their best. Increasingly, however, under the leadership of Mr. August P. Beilmann, the Superintendent, the Arboretum has become an outdoor laboratory for studying the various problems of landscape. The Arboretum has been cooperating in an intensive study of quail foods, not merely what quail might eat if driven to it but what foods they prefer if given a wide choice. Mr. Beilmann and his assistant, Mr. Brenner, have made a study of native and introduced honey plants. Jointly they have studied the ancient balance between woodland and prairie in this immediate area and produced convincing evidence that the Missouri forests as we know them are a development of the last century. The work of the Arboretum has received wide attention not only among sportsmen and conservationists but among ecologists and geographers who are concerned with the general problems of the land surface and its proper management.

(Continued on page 40)

Fox trail
meets
squirrel trail
in the
winter woods

The deer have been with us for nearly two decades at the Arboretum. Does and fawns are frequently seen by visitors in midsummer, and during the autumn it is not unusual to come upon larger groups as in the view below.



Beaver work along the Meramec River

The Arboretum at the junction of Routes 50 and 66 at Gray Summit, Missouri, is a haven for wild life. Deer, fox, beaver, coon, and possum are all at home here.

A woodcock's nest

Logs being hauled to the Arboretum's own sawmill

A "chipper" reducing weed brush (from a field clearing operation) into small chips which are used for mulching and for cattle bedding.

The Efficient Management of the Landscape

Large-scale operations are carried out in the Arboretum at a low cost in man hours.

Enlarging the pool at the East Bridge with power machinery. The dirt is used to fill gullies, lowering maintenance costs in meadows and hillsides. The pool serves as emergency water supply for fire-fighting or in periods of drought.

INSTRUCTION:—

As provided in Mr. Shaw's will, much of the Garden's teaching is closely tied up with Washington University. Mr. Shaw endowed the Botanical Garden: he also left a separate endowment to the Henry Shaw School of Botany which had been previously established by the Corporation of Washington University. Most of the members of the Garden's scientific staff therefore have dual appointments; it is a kind of interlocking directorate. Dr. Henry N. Andrews, Jr., the Dean of the School of Botany, is a member of the scientific staff at the Garden, although most of his work is carried on at the University. Dr. Anderson, the Assistant Director of the Garden, is Engelmann Professor of Botany at Washington University, and while he teaches some courses at the University most of his work is at the Botanical Garden.

One phase of the teaching program is centered as much at the Garden as at the University, the training of graduate students. Technically, they have no connection with the Garden and are merely there as guests in the library and laboratories. Practically, they serve a very useful function. They help to keep the professors human. Left completely to themselves, research professors can be a sorry lot. Their scientific precision, their finicky accuracy, which they need in the laboratory, tend to overflow out of their professional and into their private lives. They get too critical of themselves and of each other. A research laboratory without any young students coming and going usually becomes a dreary place. A few good graduate students keep it alive. They do unexpected things. They respect the professors up to a point but are sometimes engagingly frank beyond that point. In a graduate laboratory with a good reputation such as that of the Henry Shaw School of Botany, more students apply than can be accepted, and the graduate students are a group of able, interesting young people. The group working at the Missouri Botanical Garden are particularly cosmopolitan. For historical and administrative reasons few large herbaria are connected with large universities, yet in these days, if one is to go very far in herbarium work, he needs a graduate degree. The only large herbaria closely connected with graduate schools are at California, Harvard, and the Missouri Botanical Garden. For forty years the Garden has become increasingly important as a center for training of herbarium administrators and today our students come from all over the world. Last year we had one from Honduras and one from Costa Rica (both on Guggenheim Fellowships), one from New Zealand, one from Formosa, and one from India. This year some of these have received their doctorates and returned home, but another has arrived from France and a second student from New Zealand is making arrangements to be with us next year.

In addition to the courses offered in the Henry Shaw School of Botany, the Garden offers courses to the general public whenever the need arises. Nearly every spring finds a group of amateurs in the Garden's experimental greenhouse, taking a course in plant propagation. Last fall we tried out for the first time a practical demonstration course in the forcing of bulbs, for which over 200 amateurs registered. For the last five years a short course in practical plant breeding has been organized for amateur and professional greenhouse men.

The number and nature of such courses vary from year to year with the needs of the times. During its early days the Garden offered one of the first courses in Bacteriology taught in this part of the country. The young science was then having a revolutionary effect upon medical practice, and the first Director of the Garden, Dr. Trelease, organized and taught a Bacteriology course for doctors and other professional men in St. Louis. Similarly, when club women were just beginning to take a really professional interest in flower-show judging and flower arrangement, the Garden organized a three-day course in these subjects, the first one of any size in this area. In all these efforts the Garden has done the pioneering; as soon as enough interest has been aroused for the subject to be carried forward in a larger way by some other agency, the Garden has transferred its efforts to newer ventures.

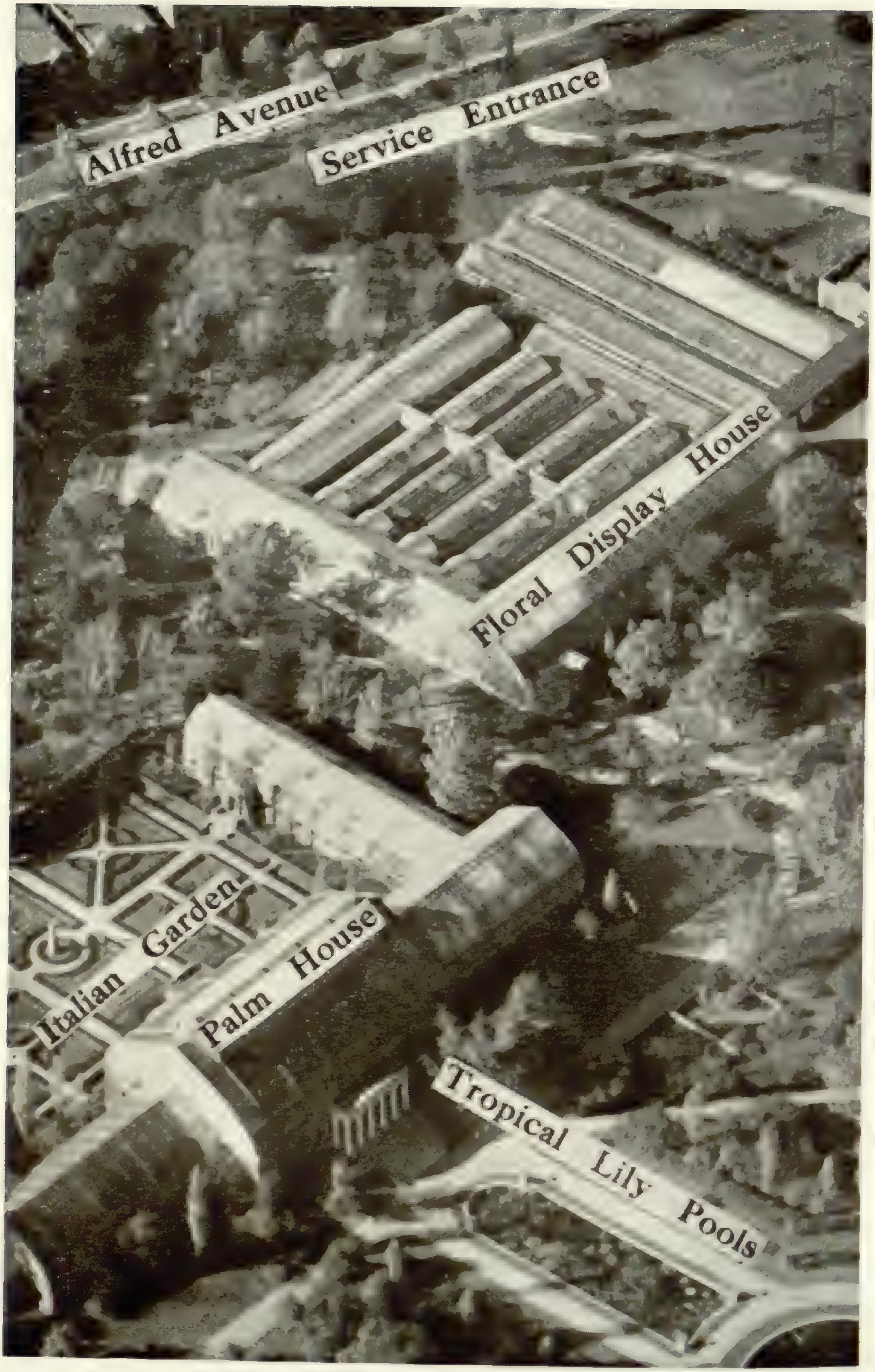
COLLECTIONS:

The Garden has notable collections of three sorts: collections of plants, collections of books, collections of herbarium specimens. Let's begin with the plants.

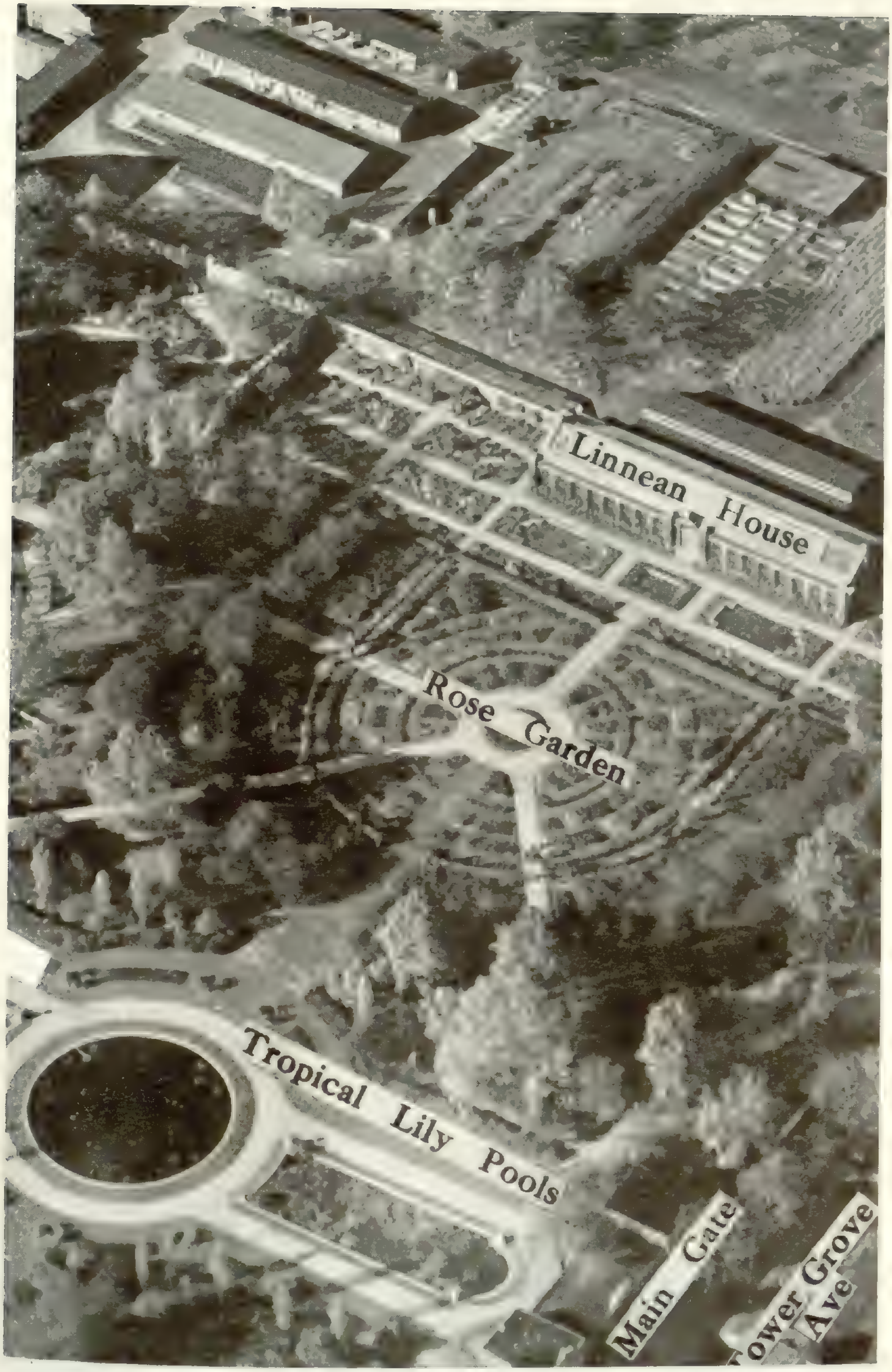
Collection of Plants.—There is a nice fable current in parts of St. Louis that the Garden has every possible kind of tree, shrub, or vine which can be grown in this climate either in or out of a greenhouse. It is a nice fable but it is fantastically impossible. There are over a million species of plants in the world; for some of the cultivated species there are thousands of varieties of each. At the moment there are being offered for sale, one place or another, several thousand named kinds of bearded irises, several thousand of narcissi, several hundred of peonies, thousands of gladiolus, hundreds of African Violets. A really comprehensive collection which includes these and all other plants readily grown here would be impossible outside of Never-Never Land. On our seventy-five acres there would not even be room for the labels, let alone the plants or people to care for them. No botanical garden can hope to grow everything, not even everything of interest and importance for that area. Every garden has to specialize.

The Missouri Botanical Garden's specialties are its collections of orchids, tropical water-lilies, daffodils, bromeliads, Missouri wildflowers, snowdrops, hardy ivy, and cacti and other succulents.

(Continued on page 42)



Shaw's Garden from the air: The Main Conservatories and the Service Entrance



Shaw's Garden from the air: The Main Gate and the Rose Garden

It requires athletic ability to work on the roof of the Palm House

A Big Botanical Garden Has Its Own Peculiar Problems

One of the big greenhouses after a windstorm.

Mixing up roach poison in wholesale lots.

Cleaning algae and other plants out of the lily pools is a never-ending task.

Paving the Palm House to reduce maintenance costs.

WOOD CUTS FROM OLD VOLUMES IN THE GARDEN'S LIBRARY

One of the Garden's most outstanding assets is its collection of old books about plants. Some of them are illustrated with charmingly effective woodcuts which depict the life of the time. These cuts were lent and copied so much that we do not always know for which book they were originally prepared.

Collection of Books.—The Garden's library has grown until it has become one of the world's large botanical libraries. Yet it is outstanding for more than mere size; it is effective. It is not the number of shots fired which win a battle but the number which hit the mark. With a library the important thing is not how many books there are but how quickly you can locate the information you are after. The Garden's library is so effective that every year finds many scholars coming to us from other institutions, to spend the time between trains, or all day, or sometimes a whole spring or Christmas vacation, running down the information they need for a book, or a paper, or some other scholarly purpose. This is partly due to the richness of our collection of books but equally important is the attitude of our librarians. There may be somewhere in the world a botanical library with more helpful librarians but none of us here have ever heard of one. It is a scholar's paradise; you arrive with a list of, shall we say, fifteen references to rare books which you haven't been able to locate in other libraries. The chances are we will have five to ten of them and furthermore the librarians will be able to get all of these within half an hour. Before the morning is over they are likely to come around with one or two others bearing on the subject that you didn't have on your list. How they do it is a mystery to us, since technically they are librarians and not botanists. Part of it is a phenomenal memory; part is complete devotion to their work. Just imagine a library in which you can go to one of the librarians and say, "I'm looking for a big thin book I saw several years ago. I don't know the name of the author or even whether it was one of a set or just a single volume. I don't even know what language it was written in, though I have a vague memory it was not English. All I remember is that it was big and thinnish and that it had a frontispiece showing a palm tree with some Indians sitting under it in a grass hut." Imagine a library in which you can give a request of this sort and know that you'll probably have the book in your hands in half an hour!

The Missouri Botanical Garden Library is that kind of a place. Is it any wonder it gets used? It is open to any one who needs to consult botanical or horticultural books, and many kinds of people use it every year. If you visit us for a few days you would probably see something like the following: staff and students using it at all hours of the day in connection with their general work; a club woman putting together the material for a paper; a manufacturer who is getting the background information concerning a plant wax long in use by primitive people and just now of promise for some specialized manufacturing process; various kinds of people with plants which, for one reason or another, they want to know more about; a pair of nuns who are taking advanced work in Biology somewhere in the city; a young couple who are planning a garden which is to have a collection of particularly choice shrubs.

The Linnean Garden in late spring

The Linnean Garden takes its name from the Linnean House, a picturesque old greenhouse built in Mr. Shaw's time and surmounted by busts of Linnaeus ("the father of Botany") and other scientists.

It is a garden of perennials with a few choice shrubs and some bulbous plants. The large shrub in this picture is a "Sweet Bay", a charming small-leaved Magnolia which blossoms in early summer, its fragrant flowers being mostly hidden among the leaves.

The library is worth much more than the money we have spent on it. For this, too, we have Dr. Engelmann to thank. He not only persuaded Mr. Shaw to found a botanical garden; he convinced him that any first-class botanical garden must have a good library. Just as soon as Mr. Shaw had formally committed himself to founding a botanical garden, Engelmann was off to Europe at Shaw's request to gather the beginnings of a first-class library. Never was money more wisely spent. There was then little competition for the useful (and frequently beautiful) old books which are the core of such a library. It was before the days of big agricultural and horticultural colleges with specialized libraries; it was before the time when these rare old books were widely appreciated for the beauty of their engravings. Many of the books which Dr. Engelmann bought for a few dollars are today worth hundreds (and sometimes thousands) of dollars and are hard to get even at such prices.

These early purchases by Dr. Engelmann were supplemented a few years later when Dr. E. S. Sturtevant, the able director of the country's first agricultural experiment station, left us his magnificent personal collection of rare old botanical books from the very beginnings of botany—herbals, natural histories, medical botanies, books of travel, etc. Most of them are illustrated with quaint but effective woodcuts on thick, hand-made paper. Four of them were printed before 1500 and many date back to the sixteenth century. There are a few larger collections of such books in the New World, but there are none where a scholar who wishes to consult them will be able to see so many in such a short time and with so little red tape.

Collection of Dried Specimens, The Herbarium.—Like the library, the herbarium actually goes back to Mr. Shaw's day. The core of it was formed by Dr. Engelmann's own collections and by the "Bernhardi Herbarium" which he bought in Europe nearly a century ago. In 1858 Dr. Engelmann was in Europe purchasing books at Mr. Shaw's request. Sir Joseph Hooker tipped him off that the Bernhardi collection was for sale at a bargain. Dr. Engelmann got the money from Henry Shaw and bought this key herbarium for a mere five hundred dollars.

To the ordinary visitor, the Herbarium of the Missouri Botanical Garden is impressive only by its size. It occupies the whole third floor in the big red brick administration building and a good part of the second floor. It consists of row after row of tall steel cases built like modern office furniture. The whole front of each case is a steel door which locks air-tight with a levered steel handle. Open up such a case; within it are shelves of specimens, all virtually the same size, all of them in neat manila folders. Each herbarium specimen is mounted on a sheet of heavy paper a little smaller than the folded half of a newspaper as you see it on the newsstand. The specimens

(Continued on page 44)

One of the Garden's recent introductions, the hardiest of all the true ivies.

"MBG Bulgaria" is a large-leaved, rapid-growing variety introduced by the Garden in 1945, after ten years of careful tests. It was deliberately sought for in those parts of Europe with a climate like our own and was collected in the grounds of the Rila Monastery in Bulgaria in 1934.

"MBG Bulgaria" is so at home in St. Louis that in those parts of the Garden where it was first planted it grows up into the trees and transforms the winter landscaps, just as it has in Europe for thousands of years.

Bromeliads, One of the Garden's Important Collections

Shaw's Garden has one of the finest collections of these strange plants of any place outside the tropics and subtropics. Bromeliads grow for the most part in tropical tree tops, but they take kindly to the dry air of modern apartments and are becoming increasingly popular as house plants.

Cryptanthus zonatus

Many Bromeliads are "tank plants" and keep their water supply in the central well made by the leaves.

Vriesia splendens

Flaming Torch Bromeliad in bloom

Bromeliad flowers are frequently of very odd colors, brown, green, blue, flaming red. Some are very brilliant.

Neoregelia marmorata

A view inside the "tank." As this picture suggests, many Bromeliads resemble the best-known member of the family, the pineapple.

View of the Rose Garden

The Rose Garden was very cleverly designed by Mr. John Noyes so that as one looks down the paths which radiate from the center of the garden each one has an interesting view. For most of them the view is attractively framed by the arches of the rose arbor which forms a semi-circular border around the collection. A corner of the Linnean House and Mr. Shaw's old brick garden wall are seen in the distance.

Close-up of hanging basket

Some of the features of the annual Chrysanthemum Show have received general horticultural acclaim: the development of hanging baskets of chrysanthemums suspended high overhead or at the summit of bamboo poles; the displays of cascade chrysanthemums to mimic the effect of falling water; the use of Japanese accessories made of cat-tails; and an extensive use of bamboo.

Setting up the Mum Show

Miss Julia Terry, Queen of the Veiled Prophet

On the Saturday afternoon after the Veiled Prophet's ball (October 10, 1953) his Queen, Miss Julia Terry, and her court visited Mr. Shaw's home to receive the greetings of more than 4,000 school children. To date over 6,000 adults have visited the home since it was opened to the public in November.

Repairing walls in Henry Shaw's old office

Under the supervision of a committee of historians and architects, the house is gradually being restored to as near its original 1848 condition as practical. Whenever possible, even when restoration work is going on, the house is kept open during its regular hours, daily from 1 to 4 p. m. More than 8,000 people went through the house this fall.

Henry Shaw's country home, "Tower Grove," faces the grove which gave it part of the name and in which Mr. Shaw is buried. During the past year the house was opened to the public with the help of volunteer hostesses from St. Louis women's clubs.

View of Henry Shaw's home through Mausoleum gates

are glued (or sometimes sewed) to the heavy white sheets and bear neat labels telling where and when and by whom they were collected. Some of those in the big steel cases were pressed and dried just a few years ago; many of them are fifty or a hundred years old; the very oldest were collected about the time of the American revolutionary war. To a casual glance they look pretty much like an old faded bit of hay carefully glued to a sheet of paper, but take one to the laboratory table and put it under a binocular microscope. Most of the little niceties of the leaf and flower (though powder-dry) are just as perfect as they were when they were pressed. The iris plants which Dr. Engelmann made into herbarium specimens before the time of the Civil War still show the same bearded zones on each sepal; each little hair is still there in perfect detail.

These specimens are precious because they are documents in the truest sense. A book about the flora of the United States will be full of botanists' statements about plants. It can be no better than the understanding of the man who wrote it and the men he studied with; inevitably it will be incomplete and in part erroneous. But an herbarium of plants from that same area is a set of documents; the actual plants are there and as we learn to work with these specimens we can draw many kinds of information from them.

Herbaria are old-fashioned, and in the United States the old-fashioned way of doing things is frequently neglected. Thanks to Dr. Engelmann and Mr. Shaw, the Missouri Botanical Garden got off to a good start with a good herbarium. It is still one of the best in the New World. For the last quarter of a century the Garden has become known to other scientists not only for its herbarium, but for various new ways of getting useful information out of such a collection. If one waits long enough the old-fashioned frequently becomes something newly recognized as interesting or exciting or valuable. This is just now beginning to happen with our herbarium, and scholars from various parts of the world are taking an interest in the new uses to which our old herbarium is being put.

EXHIBITION:—

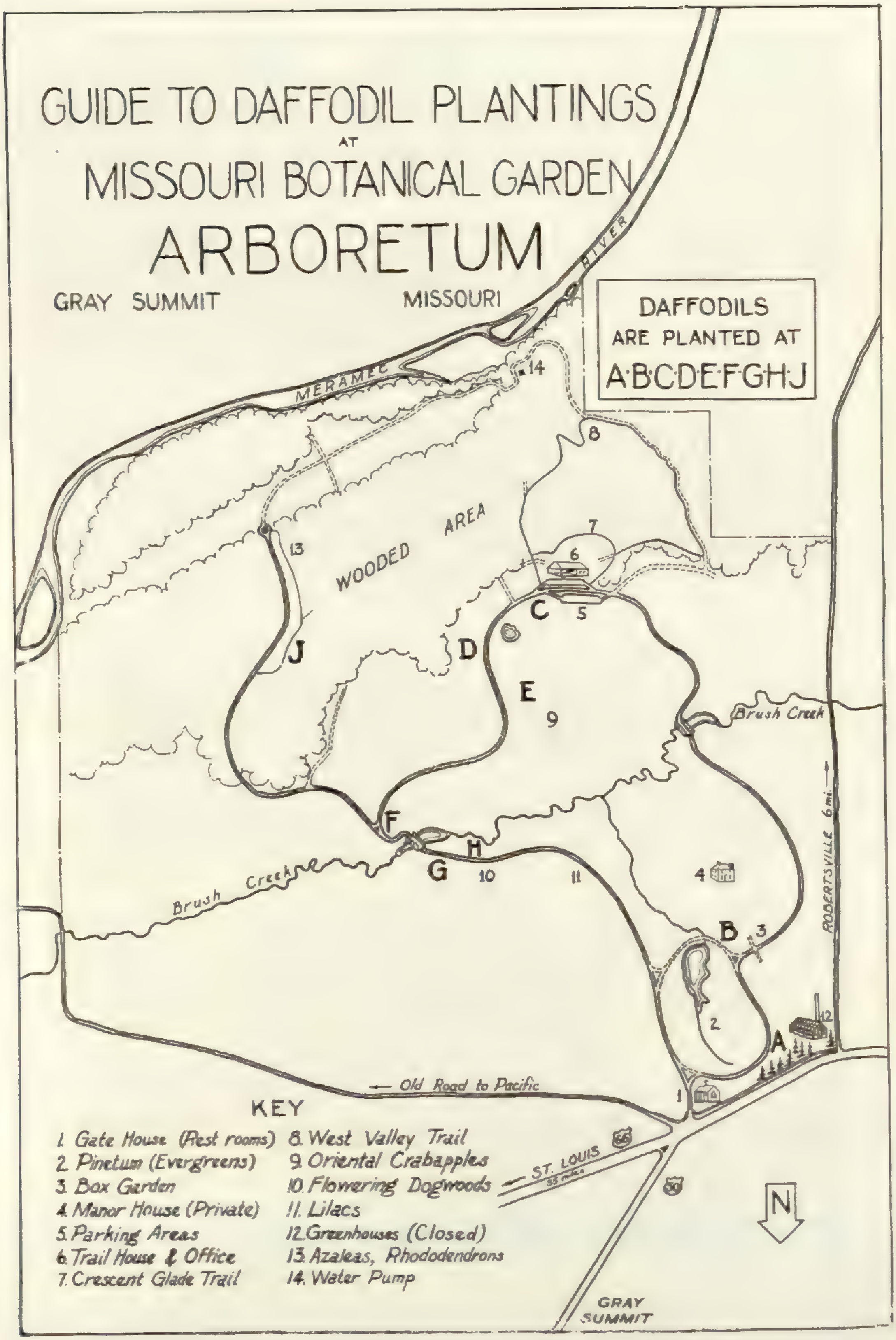
And so at the very end of this recital of the Garden's activities, we come to the phase best known to the public. It is the "Mum" Show, a tradition carried on every fall for over fifty years, and it is the Orchid Show in mid-winter, when thousands of orchid flowers are tastefully displayed, that the general public knows the most about. Many of the features of these shows developed here have been very generally copied elsewhere. The Garden pioneered in adapting the gracefully drooping "Cascade Mums" to American conditions, in developing the use of chrysanthemums in hanging baskets, in using cat-tail rushes as effective background material. Traditionally the "Mum"

(Continued on page 45)

ITALIAN GARDEN

GUIDE TO DAFFODIL PLANTINGS
AT
MISSOURI BOTANICAL GARDEN
ARBORETUM

GRAY SUMMIT MISSOURI



KEY

1. Gate House (Rest rooms)
2. Pinetum (Evergreens)
3. Box Garden
4. Manor House (Private)
5. Parking Areas
6. Trail House & Office
7. Crescent Glade Trail
8. West Valley Trail
9. Oriental Crabapples
10. Flowering Dogwoods
11. Lilacs
12. Greenhouses (Closed)
13. Azaleas, Rhododendrons
14. Water Pump

April is Daffodil month at the Arboretum

Daffodils and other Narcissi have been extensively naturalized in the meadows at Gray Summit as well as in the City Garden. Those shown in these views are largely the old variety "Sir Watkin."

A Blue Vanda orchid from the Garden's collections

There is a folk superstition that flowers which have conspicuous color should not have a conspicuous odor. Many of the orchids prove the falsity of this principle, being as fragrant as they are colorful. The Vandas in particular have a heady tropical scent, something like ripe grapes but rather sweeter. This Blue Vanda has sometimes been included in the Queen's Bouquet.

Show is open for the month of November; the Orchid Show for the month of February. Poinsettias and other seasonal plants fill the Floral Display House during the weeks between these two big shows, and the Orchid Show is followed by successive exhibits of bulbs and other spring flowers.

Bouquet of orchids presented by the Garden to the Veiled Prophet's Queen

A winter view of the Gate House at the Arboretum

A Note Concerning the Pictures in This Special Number of the Bulletin

We are indebted to many friends of the Garden, amateurs and professionals, members of the staff, and outsiders, living and dead, for the illustrations. Mr. Charles Trefts contributed the original prints from which the two color plates were prepared, as well as some of the finest of the black and white close-ups. Several of the older pictures are by the late William Trelease, the first director of the Garden. Others to whom we are indebted are: Henry N. Andrews, Jr., Alfred G. Etter, August P. Beilmann, Louis G. Brenner, Paul A. Kohl, Lad Cutak, Clifford Paulsen, Robert W. Schery, Hugh C. Cutler, and Edgar Anderson.

Contributions and Bequests

Contributions and bequests to the Missouri Botanical Garden may be made in securities, money, or books. They may, if desired, take the form of a memorial to a person, to be named by the giver. For those desirous of making bequests to the Missouri Botanical Garden the following form is suggested:

FORM OF BEQUEST

I do hereby give and bequeath to the Missouri Botanical Garden of the City of St. Louis, State of Missouri:

_____

_____

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The total of contributions in money or property not in excess of 20 per cent of the individual's adjusted gross income for the year are allowable as deductions in computing net income for federal income tax and not in excess of 15 per cent thereof in computing the Missouri state income tax. Illinois has no income tax. The limit for corporations is 5 per cent of net income.

Bequests to the Garden by will are deductible without limit, in determining the federal estate tax and are exempt in any amount from Missouri and Illinois state inheritance taxes.

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SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden carries on the garden established by Henry Shaw over a century ago at "Tower Grove," his country home. It is a private institution with no public support from city or state. The old stone walls and cast-iron fences, the Linnean House, the Museum, the Mausoleum and the "Old Residence" all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's Day and Christmas) from 9:00 a. m. until 7:00 p. m., April to November, and until 6:00 p. m., November to April, though the greenhouses close at 5:00 p. m. Tower Grove, itself, Mr. Shaw's old residence, is open from 1 until 4. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., opposite the junction of routes 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

Growing Exhibition Chrysanthemums at Home

A Symposium Arranged by a Committee of the Greater St. Louis Dahlia and Chrysanthemum Society

Dan O'Gorman, Chairman
William N. Avis
L. C. Bennett
Harold R. Hartman
John Ollinger
Ralph H. Rabenau
Hubert G. Sandefur
George A. Schaefer

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Please: Do not discard a copy of the Bulletin. If you have no further use for yours pass it along to a friend or return it to the Garden. Return postage will be guaranteed.

Missouri Botanical Garden Bulletin

Vol. XLII MARCH, 1954 No. 3

THE BACKYARD GARDENER CAN GROW GREENHOUSE MUMS

HAROLD R. HARTMAN

Many articles have been written with detailed instructions on "how" to grow greenhouse chrysanthemums. Recently published is an entire book devoted to mums, written by two well-known non-professional growers and covering every phase of both hardy and greenhouse types. Since minute cultural instructions can be found in these writings, perhaps a brief outline of how the ordinary backyard gardener can grow luxurious greenhouse-type mums will be of interest, the writer being an ordinary backyard gardener.

First of all, it should be emphasized that there is no mystery involved in growing good mums. They are easy to grow and success is well within the reach of the beginner. The writer is purposely avoiding mention of a list of recommended named varieties; there is an endless number of good named varieties, and such a list would merely be a reflection of the grower's personal choice and not because many other varieties weren't just as good. The classification of bloom form, for instance, embraces the singles, semi-singles, anemones, pompons, incurves, decoratives, regular and irregular reflexes, spoons, quills, threads, and spiders, with small, intermediate, and large blooms in many of the classes. Too, there are early, intermediate, and late bloomers in some classes, and each class has a range of colors found in few other flowers.

Types, colors, and period of bloom therefore become a matter of personal taste, and it behooves the beginner to visit both amateur and professional growers, particularly during the blooming season, to discuss his problem of selection. In this way he will not only receive information from an actual grower who finds it necessary to soil his hands occasionally in pursuit of his hobby, but he will also see in the various stages of growth and bloom those varieties that always grow well in spite of weather conditions and those which require extra care to secure top-rate blooms.

Rooted cuttings or plants established in 2½-inch pots should be obtained in the spring from a reputable grower. The plant you will grow, no matter how well you care for it, can only be as good as the parent stock from which it came; therefore, it is extremely important to know that your plants came from clean, healthy stock, free from disease. Some growers transplant from

2½-inch pots to 4's, then to 6's, and finally to 8's. My experience indicates there is no difference in the final plant, and to avoid a lot of unnecessary work and possible injury to the roots during the shifting process, I shift the 2½-inch-pot plant immediately to the 6- or 8-inch pot. Plants do well in 6-inch pots; 8-inch are somewhat clumsy to handle, a bit more expensive, and require more room in the mum shelter. However, the larger pot does allow for more root growth and, under normal conditions, should make a somewhat stronger plant. I use both 6's and 8's, the 8's being well adapted to the tall, strong-growing and large-blooming standard varieties. If pots are not new, they should be thoroughly scrubbed inside and out with a stiff brush while submerged in a container into which fresh water is freely flowing.

Potting soil should contain humus, be capable of retaining plant food, and sufficiently porous to allow for good drainage. The formula for potting soil which I have found to give good results is: 3 parts of good garden loam, 2 parts of well-rotted leaf mold, 1 part of pulverized cow manure, and ½ to 1 part of sand. When potting, allow about 1 inch from the top level of the soil to the top of the pot. This will provide space for water during the hot summer months. A layer of broken pots should be placed in the bottom of the pot to assure good drainage. The pots are then plunged in the garden, in rows two abreast with a path between the rows of sufficient width to allow for free movement to water, spray, tie, and disbud the plants. The beds should receive sunlight at least half of the day and be sufficiently open for free movement of air between the plants.

Pinching the plant after it is some 6 inches high is indicated to throw off side-shoots and provide more than one stem to the plant. The frequency of pinching depends on the type of mum; the tall standard incurves and reflexes are allowed two to three stems per pot; you will want the bush varieties to have a multitude of stems for mass blooms. In setting out your plants for summer growth, you will want to know the final form the plant will take. The tall, column-growing standard incurves and reflexes may be plunged within a few inches of each other in the row and the rows a foot apart; those which have a habit of spreading must have plenty of room to grow.

After the plant is about a foot high, it is well to provide stakes for support. For the tall-growing standard mums, I have found a 4-foot steel stake of No. 8 galvanized steel to be excellent. Though the initial cost is a bit higher than bamboo or wooden stakes, the steel stake retains its straightness and rigidity, is neater in appearance, and practically lasts a lifetime. The 4-foot stakes are ample for the tall-growing types and may be cut to size for the lower-growing types. For tying the plants to the stakes either use twine or tiny metal gadgets which are pinched onto the stem and stake. They are quite simple, inexpensive, readily applied and can be home-made or purchased

from a florists' supply house. There is no formula for tying; you merely tie whenever a stem seems to need support.

Your mums need little attention during the summer growing season. The condition of the soil in the pots will vary with the weather, and watering must be adjusted thereto. Spraying with insecticides and fungicides is indicated upon the first sign of trouble. Aphis seem to be particularly fond of mums, but they are easily controlled by a spray of nicotine solution. Red spider gives occasional trouble and can be controlled with several spray solutions sold commercially. Since some of the new insecticides are deadly to the grower as well as the insect, caution should be exercised in their use.

Mr. Harold Hartman entering his 8 × 12 foot backyard greenhouse which is heated by a small kerosene stove.

With the approach of fall and shorter days and longer nights, buds will begin to form rapidly, and here again disbudding requirements are predicated by the types of mums you are growing. You must know each type of mum to know how much to disbud. Only one bud per stem is allowed for the large standard incurves and reflexes as contrasted to those types which grow in bush form and are not disbudded at all, since disbudding would not perceptibly increase the size of remaining blooms and would only rob you of a wealth of small blooms, normal to the plant.

The plants may be given a feeding at intervals during the growing season and up to the time color begins to show in the buds. I have found that liquid fertilizers are not only easier and cleaner to apply, but the amount of nourishment can be better controlled by their use. Extreme care must be exercised in feeding the plants, however, for over-feeding results in "soft" plants, weak stems, and distorted blooms. Over-feeding is far worse than no feed-

ing at all, so, if in doubt, tend to go easy on the feeding program until you are experienced in this phase of mum culture.

Before danger of the first frost, the pots should be removed from the open ground where they were plunged at the beginning of the season and scrubbed to remove dirt from the outside. The dried and discolored leaves are then removed and the plants placed in the mum shelter according to size and shape and so arranged to give a pleasing color effect. A shelter of some sort is necessary for these somewhat tender greenhouse-types to prevent damage from rain, wind, frost, and freezing weather if late-blooming varieties are grown. The shelter may be simple or elaborate, depending on individual taste and pocketbook, but should provide ventilation and movement of air, a roof which is sufficiently tight to prevent water from dripping down on the plants and blooms during the cold fall rains, and controlled heat to cope with cold spells.

The writer's mum shelter is of very simple and inexpensive construction and can be duplicated by anyone who can use a hammer and a saw. It is 8 feet wide and 12 feet long, providing ample space for 75 to 80 pots; the height of 8 feet in the rear and 7 in the front allows good roof drainage and sufficient air space above the heads of the plants. The uprights are 4 × 4″ posts, placed at 3-foot intervals, and support a roof made up of ordinary 3 × 6′ hotbed sash, caulked together. The sash are placed from the front of the house; the remaining some 2 foot to the back is a hinged ventilator, in two sections of 7½ feet each, running the length of the house. The back of the house which faces the west, and one side facing the north are completely built up of 4″ tongue and grooved 1 × 4″ fir boards; the east (front) and south sides are built up to 4 feet of this same material, with hotbed sash used to cover the remaining space up to the roof on the front. However, on the south side I have experimented with a piece of corrugated synthetic fibre glass material, 8 × 3⅓′, placed horizontally. Not only is this material practically unbreakable and requires no upkeep as compared to glass sash, but its translucent texture allows plenty of light to enter the house minus the glare of direct sunlight. The present cost of this material, however, does not encourage more extensive use. An ordinary screen door covered with "glass cloth" for light and insulation fills the door requirement.

For heating this size shelter, ample protection is afforded by a gallon-size cylindrical-shaped kerosene heater. Regulating the heater to provide night temperatures of not over 40° F. will hold the blooms in better condition than a higher temperature. This type of heating is inexpensive and the fumes seem to have no ill effect on the plants or blooms, but it is well to keep the wick clean at all times to assure perfect combustion. The ventilators must be kept open during the warm, sunny fall days, for otherwise the temperature in the house will soar and cause the plants and blooms to wilt. An accurate

Fahrenheit thermometer, hung near the center of the house and about half way between the tops of the plants and the roof, will be an invaluable aid to temperature control. Leaving the door open when the days are warm will provide a circulation of air through the house and out of the ventilators. Incidentally, the interior of the shelter should be painted a bright white to provide a maximum of light reflection, essential in this case since two of the sides have no glass.

Care should be exercised in watering now that the pots are indoors, so to speak. Water the pots only, and not the leaves or blooms, since water under these conditions has a tendency to rot the blooms, especially the large incurves and reflexes, and wet leaves invite fungus diseases. You will find that insects are now easier to control than when the plants were growing in the open. Shading the roof with a whitewash solution or using lath frames will distort the direct sunlight during bright periods, holding the plants in better condition and preventing fading of the blooms.

Compared to many other flowers, mums are not nearly as demanding in their needs, and if the simple rudiments of culture are followed, success should follow. As enthusiasm and interest mount, so will the extra frills of care and culture and superior flowers of all types will result. You are certain to meet other growers, exchange ideas and theories, swap plants and pool orders, and become an enthusiastic exponent of this king of flowers. There is a lot of fun in having a wealth of bloom when everything else in the garden is gone, and accomplishing this with your own hands should be a source of personal pride and satisfaction.

GROWING MUMS IN A PLASTIC GREENHOUSE

JOHN OLLINGER

My first year of growing the large chrysanthemums outdoors was anything but the elaborate setup we have today, and looking back over the last eight years, I note that most of those now enjoying the great pleasures and satisfaction of outdoor mum-growing started in a small way and increased and improved their mums each succeeding year.

My first experience was on a plot of garden space 18′ × 4′, in which I planted thirty mum plants. I staked and tied them, and when buds showed color I drove a larger stake at each corner of the patch to support the frame covered with waxed muslin. This kept the water off the blooms and is one of the simplest ways to grow big, beautiful "football" mums outdoors. The following year I fitted a water-pipe frame around the mum patch, and instead of waxed muslin I covered the frames with Plexiglas, as this is more serviceable. When threatened with a killing frost, I simply throw an extra cover, such as a blanket, sheeting, etc. over the top, and the blooms will be pro-

Mr. John Ollinger of Afton grows both hardy and greenhouse mums.

tected from damage even to as low as 28 degrees. The sides need no covering. At the present time I am growing a good many of the early-blooming varieties exactly that way.

All of the writers of the articles in this bulletin are members of the Greater St. Louis Dahlia and Chrysanthemum Society. We meet in the Cabanne Library the second Friday in every month. We exchange plants with each other or purchase new varieties from commercial growers, but our basic planting is from plants grown the previous year. These were cut down to about an inch from the ground, the clumps lifted into a cold-frame, and dirt filled around the sides of the clumps to prevent air pockets. They were then watered thoroughly once, sprayed with Vapatone to destroy aphids and red spider, and covered with sash to protect them from snow or rain. Remember that cold and freeze do not kill the plants; it is usually drowning which does the damage. I have already wintered some by placing the clumps tightly together on top of the ground, covering the plants with rough straw (without the chaff), and all of them came through nicely the following spring. Simply keep them from getting "wet feet."

Propagating.—In March and April you will note quite a few new shoots growing from these clumps. Prepare a rooting box, making it any convenient length and width, but, more important, about five inches deep. Fill with Vermiculite, soak thoroughly, and tamp firmly with a wide piece of wood. When these new shoots are 3 or 4 inches tall, cut them off below the leaf node, trim off the lower leaves, dip cut ends in Rootone, and sink them

half their length into this wet Vermiculite, tamping well around them to eliminate air pockets. Space about an inch apart, allowing about 3 inches between rows, and wet down thoroughly. I have an open porch on the north side of my house, with an hour of morning sunshine. The rooting box is placed on the floor on one-inch sticks laid flat to allow for air circulation underneath the box. Then I have a frame about 6′ × 3′ covered with a heavy cheese-cloth which I set on end and lean against the wall, thereby protecting the cuttings from sun and wind. Water about every three days in normal weather, and in three or four weeks the cuttings should be well rooted. They are perfectly safe in a temperature as low as 32 degrees, and should there be a threat of colder temperature simply take the box into the basement for the night and bring it back on the porch in the morning. The box of Vermiculite is very easily handled, which is the advantage over rooting in sand.

Potting Soil.—Some growers use great care in preparing their potting soil and some even weigh each portion of the humus, sand, peat moss, fertilizer and what not. I use a good garden soil, with about 25 per cent well-rotted compost, and that's it. When the cuttings are well rooted, pot them in this soil in 4-inch pots and place them either in a cold-frame or out in the open, but be sure to shade them for at least a week or ten days to harden off. Let them grow in these 4-inch pots for another couple of weeks or so, and they are then ready to be planted. Since the plants have not been pampered, they will not be set back when the roots start reaching out in the open soil. In other words, don't make the potting soil any different from the soil in which the plants will have to grow 95 per cent of their lives.

Planting Time.—I have spaded the soil deeply in the fall, adding a liberal quantity of well-rotted compost and barnyard manures. In the spring you can spade the ground again when it is in good workable condition, but I don't. I simply apply a light application of Vigoro and rake it in thoroughly. My plantings start about May 15 and continue through May 30. You can plant as late as June 20, but until you have more experience do your planting in May.

Permanent Setup.—In order to grow some of the later bloomers, I selected a spot in my garden 12′ × 12′ and built a frame-work of 2 × 4's 7 feet high with a center slope of 1 foot. The top and upper sides of the frame-work is sectioned off in 6′× 3′ openings, while the lower part of the sides is 6′ × 4′. About May 15 I mark off the spots for the plants, three rows on the two sides, two rows at the far end, and leave walking space through the center. Plant 18 inches apart each way, and that will give you room for 54 plants. Dig the holes about 12 inches deep, and mix thoroughly with the soil a little wood ashes, if available. Plant the mums about an inch deeper than they were in the pots, water well, and level the hole with the remaining soil. After four weeks, give the entire bed a small amount of Vigoro, raking

it lightly into the soil, and water heavily. When the plants are about 8 inches tall, top them and apply a well-rotted cow-manure mulch 3 inches thick over the bed. As the laterals begin to grow, select about four or five of the healthiest and pull off all the rest. Be sure you clean out these laterals as side growth appears, in order to preserve all of the plant's strength for the bloom which eventually will develop at the tip of each stem.

Selecting Buds.—Here again is where some of us differ. Let's review this pinching process. When the plant is 8 inches or so tall, you top it; that is, you pinch out the center growth and tie the plant securely to a 4-foot stake. In a couple of weeks laterals will form. These when left to bloom will be the "first crown" buds. All side growth is removed as quickly as possible. As the canes continue to grow keep them well tied to the stake to insure straight upright stems. To the beginner, I suggest using this first crown bud for his bloom. A lot of varieties do best in this section of the country on the first crown bud, difference of opinions notwithstanding. After more experience you will find out which do better on second crown buds and which are best on terminal buds. For a variety preferring the second crown bud simply give it another pinching on the date deemed proper for the scheduled blooming time and follow the same procedure of cleaning out all side growth. If you choose the terminal bud merely pinch the plant a third time, although frequently you can get the terminal bud by simply passing up the second crown bud when it appears and waiting a couple of weeks till the tip of the plant grows into a cluster of buds. When these are large enough to disbud clean out all but two. Pinch out any buds appearing before August 10. In selecting a bud it is best to allow two buds to form on each of the five canes you have been growing. Let these get to about the size of a pea, then remove one and leave the healthier on each cane. This procedure allows for any damage that could happen to some of the buds.

Watering and Spraying.—When the plants are about 15 inches tall, apply a well-rotted cow-manure mulch about 3 inches thick over the entire bed. Some growers use peat moss, compost, etc. Water heavily about every seven days, although the frequency of watering depends on the weather. Don't let the plants suffer for moisture. When watering during the earlier part of the day, wash the leaves too, as they can breathe better with clean open pores; but evening watering should be confined to the soil only, otherwise you take a chance of getting the plants mildewed. I don't find it necessary to spray oftener than about four times during a season. A mixture of Vapatone and DDT keeps my plants free of any pests. To those of us who crowd the plants or don't have sufficient air circulation, dust the underside of the leaves once, about October 1, with sulphur.

Give a light application of Vigoro again about July 25 and August 20,

then no more during the balance of the season. As soon as the buds show color, I go to work with the covering for my framed house. As I mentioned earlier, the whole framework is sectioned off in 6′ × 3′ openings, top and sides, so during the winter months, I made Plexiglas frames 6′ × 3′. These are fitted with hooks to match the eyelets on the house frame, and now I simply hook the Plexiglas frames into place, including the door of the same material, and I'm all set. When there is danger of a temperature drop to below 28 degrees or so, I light a small coal-oil burner, set it in the center of the "room." This will protect the plants down to about 10 degrees, giving me beautiful blooms up to December 10. Mums should be grown in full sunlight.

The following are some of those I would recommend for good results:

Early-blooming: Buttercup—yellow, Major Edward E. Bowes—pink, Morgan's White—white, Mrs. H. E. Kidder—yellow, Silver Sheen—white, Watanabe—yellow.

Late-blooming: Bronze Nerissa—bronze, Bunbu—pink, Fern Edwards—pink, Garnet King—red, Indianapolis Pink—pink, Indianapolis White—white, Melody—yellow, Mrs. David F. Roy—red, Tranquility—white, Yellow Frill—yellow.

FIVE RULES I USE IN GROWING EXHIBITION MUMS

HUBERT G. SANDEFUR

No. 1. *Potting Soil and Care of My Plants.*—

I use leaf mold and manure that is well decayed for my fertilizer; 1 part manure, 1 part leaf mold and 2 parts soil. I turn and mix this about four times. I believe that by making my cuttings after the fifteenth of April the plants will not get so tall. A flower is not pretty if you can't look it in the face. I always try a few new plants each year, but always have plenty of old varieties that I know will grow for me. This way your planting will always be good.

I place my cuttings, which measure about 3 inches, in a box of sand about 5 inches deep. These I keep out of full sun and wind for at least a week, then I harden them off with sun and air. It takes three weeks for them to root. Then I pot them off into 2½-inch pots for three weeks, 4-inch pots for four weeks, and last in 8-inch pots. These are sunk up to their necks with a 2½-inch pot under them. I do this so that the roots can go through the hole into the small pot; then in taking them up I can cut off all roots that have come through. This will not hurt the plants in any way. I take them up when they show color. I disbud all large varieties to three or four blooms.

Recently I built my new home with garage attached. All windows in this garage are on the north and east side with an overhanging door on the south side so that when displaying my mums they will get plenty of air.

Living with mums as I do is a pleasure, for I take three steps from my bedroom and I am surrounded by 500 blooms. Some of these are up to any greenhouse standard.

No. 2. *Spraying.*—

I spray my plants with DDT and Vapatone once a week, starting when they are rooting in the bench.

No. 3. *Watering.*—

Unless there is a hard rain, I water my plants every morning before the

Mr. Sandefur of St. Louis utilizes his garage for the display of his mums.

sun comes up; this tends to keep the plants fresh all day. Plants are dependent upon you for their water if they are grown in pots.

No. 4. *Feeding.*—

Mums like their meals the same as you and I, but they can also be overfed. I discovered this point this year to my sorrow on the TURNER varieties. This variety, of course, is your largest mum, and I decided to make my twelve plants even larger. I gave them two shots of Vigoro and two of 20 per cent nitrogen. Result: deformed buds! They blew their tops. Under each bud the stems looked as if they had been cut half in two with a knife. In a growing season I use 4 teaspoonsful of Vigoro, but nothing after the buds show color.

No. 5. *Displaying Mums.*—

I can display 125 plants to their best advantage in my garage which is 12′ × 21′. All tall mums go to the back, next to the walls and windows,

and the shorter ones in front. All bush varieties are placed down the middle forming a horseshoe so that spectators can walk in a half circle without brushing against the blooms. I do not place each color alone. Instead, I like to distribute them so that they blend in a more satisfying color array.

I have listed below some varieties which in my ten years experience in growing large mums have proven to be of excellent quality to me:

Large Globe Shape	*Pompons*	*Spider Mums*	*Cascade Varieties*
Bronze Nerissa	Brilliance	Bunbu	Jane Harte
Country Maiden	Gold Coast	Emerald Isle	Anna
Fern Edwards	Gypsy	Georgina Hedinger	
Indianapolis—	Little Dot	Lorraine	
White and Bronze	Nuggets	Marsha	
Major Edward E. Bowes	Pink Izola	Masumi	
Mrs. David F. Roy	Queen of the Pinks	Melody	
Mrs. H. E. Kidder	Soroku	Mrs. V. Mood	
Stephanie	Thyra	Tranquility	
Watanabe			

CHRYSANTHEMUMS, ONE OF OUR OLDEST FLOWERS

DAN R. O'GORMAN

Chrysanthemums should have a prominent place in our fall garden, as no other plant will give as much color and bloom, beginning in September and braving early frost until only a hard freeze cuts them down.

The history of the Chrysanthemum dates back over 2000 years. The Chinese philosopher, Confucius, wrote of this flower about 600 B. C. in his book *Li-Ki* (Ninth Moon). History tells us that in the year 386 A. D. seeds of the Chrysanthemum were brought unto Japan. From then on the Japanese played a leading role in its development, and it was later adopted as the national flower of Japan. The original Chrysanthemum was yellow, and for this reason Linnaeus in 1753 gave it its name, taken from two Greek words, *chrysos*, meaning gold, and *anthos*, meaning flower.

All this took place centuries ago, but it is only in the last generation that the mum has developed into the beautiful garden flower we have today. Much of this development has been due to the work of such men as Elmer D. Smith, Alex Cumming, Charles Totty, Eugene Michel, and others.

The aim in breeding Chrysanthemums is to produce a good flower that is winter-hardy and early-blooming. The term "hardy mum" must be taken with reservations; the term "garden mum" would be better suited. There are only a very few of the so-called "hardy mums" that will live through our winters without protection.

Soil.—Chrysanthemums prefer a sunny location in good average soil with plenty of humus. There must be perfect drainage, as mums will not succeed in a poorly drained location. They like plenty of water, but it must be

moving. Prepare the bed to a depth of 12–18 inches. Dig in plenty of well-rotted manure, peat-moss or leaf mold, and some superphosphate. Be sure that any leaf mold or organic matter is thoroughly decayed, or nitrogen deficiency will result.

Planting.—Plant in spring and do not crowd; 18 inches apart is about right for most hardy types. The large exhibition types which are grown one or two stems to the plant may be planted as close as 10 inches apart both ways. Mums must have plenty of air circulation, as crowding is one of the surest ways to encourage foliage diseases, aphids, red spider, and other pests.

Plants that have survived the winter will grow numerous young shoots in the spring. When these shoots are about 4–6 inches tall the entire clump can be dug, and each shoot, with its root system, can be separated from the old plant and planted separately. This is the easiest way to increase the plantings.

Many growers prefer not to disturb the clumps but to allow the shoots to grow about 6 or 8 inches high and use them for cuttings. This is done by cutting, with a sharp knife, about 3 or 4 inches off the shoots just below a leaf node. Treat the cuttings with Rootone and insert them in sand or Ter-a-lite and place in the shade out of any draft. In about ten days to three weeks new roots will have formed and the plants can be potted and later put out in the garden.

The main reason for taking cuttings is that some disease may remain over winter in the roots of old plant. These diseases then follow growth up the

Mr. Dan O'Gorman waters plants in his simple mum shelter built at a minimum cost.

stems of the new plants, but not as fast as the stem grows. If we can take cuttings of the new fast-growing shoot we can get growth before the disease gets up that high. Then, too, many think that a plant from a cutting makes a better bush than one from a division.

Fertilizers.—Mums need plenty of nourishment but must not be over-fed. If fertilizer or plenty of manure was incorporated in the soil at the time of planting, regular feedings of liquid manure every ten days during July and August should suffice until the latter part of August or the first part of September. At this time an application of a good complete fertilizer will act as a stimulant.

Where liquid manure is not used, an application of about 3 pounds of complete fertilizer for each 100 square feet of garden can be given once each month during July and August. Do not feed after the buds show color, as this will result in poor-quality soft flowers. As long as the plants have a healthy soft vigorous growth they have enough nutriment. When the leaves turn a dark color and are so thick and brittle that they break when folded they are being over-fed and all feeding should stop.

Pinching.—Pinching of mums controls the form and branching of the bush. When the plant is about 6–8 inches high, pinch the top inch out. This will cause new shoots to grow from the side. Select the three strongest of these, and when they are about 4 inches long pinch off their tips. Allow two side shoots to grow from each of these and then pinch again to allow two shoots to grow from them. This should give a well-branched compact bush. Pinch out any buds that form before the first of August (except in very early-flowering varieties). Do not pinch any more after the first of August. When pinching, be careful to leave enough soft growth for the new side, or lateral, to form. Laterals that form in hard wood should be removed.

Cushion-type mums which naturally grow in a low mound need no pinching. Tall-growing types must be staked. This must be done early and the plants kept tied, or a strong wind may snap the whole plant off.

The method of pinching the large exhibition mums is different from that used for the garden or hardy mums. The plants are allowed to grow to about 8–10 inches before the tip is pinched. This is called the break-bud pinch. Then one to four laterals are allowed to grow (all others are removed). These laterals will form what is known as the first-crown buds. Most first-crown buds do not form good flowers, so when these laterals are about 6 inches long they are pinched. One lateral is allowed to grow from below this pinch. The bud formed on this second lateral is known as the second crown bud. Some growers save this bud as on some varieties it produces the best bloom. However, this second lateral can be pinched and the

growth from below this pinch will produce the bud known as the terminal bud. This terminal bud must be allowed to produce the flower. When you purchase this type of mum ask the dealer which bud to save. If you cannot find out the best bud to save, grow two stems to the plant; take the second crown bud on one stem and the terminal bud on the other. Then you can decide which is the better flower.

Most of the exhibition-type mums bloom later in the fall and need protection from early freezing. They also need some sort of cover to protect the blooms from rain. When the flower forms it has a cupped shape center, and water will rot the bloom if allowed to settle in this cup.

Spraying.—Spraying should start early, as soon as the plants are set out. They should be sprayed for green and black aphids, leaf hopper, leaf miner, red spider, cucumber beetle, grasshoppers, and other insects. There are new sprays to control aphid and red spider—Vapatone, Malathion, etc. Chlordane will control grasshoppers. If red spiders are present, spray every four days with Vapatone, Spider Rid, Dimite or Malathion, four times.

Fermate will control many fungous diseases such as leaf spot. A good all-purpose spray is a mixture of Vapatone, Chlordane, and Fermate, used every ten days.

Chrysanthemums love a good mulch of well-rotted manure or compost, put on about the first of July.

Varieties.—Some hardy or garden varieties that have proven satisfactory in this locality are:

White—Avalanche, Ermine, Irene, September Queen, White Dot.

Yellow—Mrs. H. E. Kidder is the leading yellow. It can be grown as a bush or as an exhibition type. Other good yellows are: Charles Nye, Gold Coast, Lee Powell, Madam Chiang-Kai-Shek, and Nuggets.

Pink and Lavender—Alex Cumming, Betty, Cecil Reed, Early Wonder, Lavender Lady, Olive Longland, Patricia Lehman.

Red and Bronze—Carmine Queen, Courageous, Cydonia, General MacArthur, General Omar Bradley, Red Velvet, Ruby Pompon, Serenade.

Some of the best of the large exhibition type are the following:

White—Ambassador (large incurved), Indianapolis White (large incurved), Marketier (large semi-incurved; blooms late; good for potting and if taken indoors blooms for Thanksgiving), Silver Sheen (large incurved).

Yellow—Butterball (large incurved), Friendly Rival (large incurved), Gold Lode (large reflexed), Indianapolis Yellow, Mrs. H. E. Kidder (large incurved), Watanabe (large incurved).

Red and Bronze—Ben Leighton (red incurved), Garnet King (large reflexed), Golden Bronze (large), Hilda Bergen (incurved, mahogany), Indianapolis Bronze (large incurved), Mrs. David F. Roy (incurved, reddish bronze), Sunnyslope Bronze (golden bronze).

Pink—Indianapolis Pink (large incurved), Major Edward E. Bowes (semi-incurved), Orchid Queen (large incurved).

There are many fine Spider types. Here are a few that have been grown successfully here:

White—Anne (pure white), Morgan's White, Sunnyslope Splendor, Tranquility (a beautiful white).

Yellow—Albert Witt, Yellow Frill, Yellow Rayonante.

Pink and Lavender—Bunbu (orchid pink), Georgina Hedinger, Rayonante (light rose, quilled petals).

Red and Bronze—Bess Witt (apricot-bronze), Chopstick (henna-red), Mauve (wine-red).

GROWING THE LARGE CHRYSANTHEMUMS OUTDOORS

L. C. BENNETT

The start of the mum-grower's year should be about the latter part of March, if he intends to propagate his own plants. If there are only two or three sprouts coming up out of the stock plants it would be a good idea to pinch the tops out of each of them about the middle of February, so as to start them branching and thereby have more sprouts suitable for cuttings.

Box for Cuttings.—This box should be made about 4 inches deep with enough small holes or cracks in the bottom to admit some air, and also for drainage. Put ¾ inch of gravel in the bottom and then fill the box with fairly coarse sand. Give a good sprinkling, and then you are ready to put in your cuttings.

Making Cuttings.—The first most important thing to have in making cuttings is a very sharp knife or a razor blade, then some tags on which to write the name of the variety, and a pencil, preferably a black wax or water-proof one.

Selection of cuttings should be made when they are 4–5 inches long. Trim off the bottom four leaves, and with a roll over the edge of your tool cut off excess stem, just below where the bottom pair of leaves were cut off. With the top or non-sharpened end of your pencil push a hole about 1½ inches deep into the sand and then carefully drop the cutting into it. Using your pencil again, punch several holes in the sand about half an inch from the newly planted cuttings. This will firm the sand to the cutting without scratching or breaking the very tender outer surface of the stem. Attach your tag with the name of the variety written on it and give the cuttings a good watering, preferably with a florist's syringe.

Do not crowd your cuttings in the box. Have them about 1½ inches apart in rows about 3½–4 inches apart. Place this box in some sheltered place outdoors with some air space under it, where the wind and sun will not blow or shine directly on it for a week or ten days. By that time the cuttings should be pretty well hardened off and can be gradually exposed to full sun. During this rooting time care should be taken against over-watering. More cuttings have been lost from too much water than by not having had enough. It doesn't hurt them to wilt a little sometimes.

In about three to four weeks there should be a good root system on these cuttings, and they should then be potted into 3-inch clay pots. The potting

mixture should be preferably just good garden soil with, if available, about 25 per cent well-rotted leaf mold added. A little hardwood ashes and a light sprinkling of dehydrated lime will prove to be helpful. Keeping these newly potted plants in a partial shade for a few days will also help. You can note when they have started to grow, and gradually give them full sun.

When they have established themselves in the 3-inch pots and have formed three or four pairs of true leaves, the tip of the plant should be pinched out. This will cause the plant to start branching. At about this stage the plants are ready to put into larger pots or to plant out into the bed where they are to be grown.

If planted outdoors (May 10 is a safe date but they can be set out up to June 1) 14 to 16 inches apart will give them good growing room. A 5-foot stake should be at each plant to which the four, five, or six laterals per plant should be tied as they grow taller.

Preparation of Bed.—As early in the spring as the soil is in proper working

Mr. Pat Bennett built a garage lean-to for his mums and heats it with two hot plates with bricks on top of them.

condition put on a liberal amount of well-rotted manure, about a pound of bone meal, and a pound coffee can twice full of wood ashes to each square yard of bed. Turn this all under and mix thoroughly. Try and turn the bed over again at a later date before planting, again mixing well. The plants should not need any further fertilizer until about the latter part of July; at this time apply Vigoro at the rate of 3 pounds per 100 square feet, and the same amount again about the first week of September. When applying this fertilizer keep it well away from the plant, rake it in lightly, and water well. It would also help if the bed was mulched about the middle of July.

Second Pinching.—Having pinched out the plants in early June there should now be four to six laterals per plant that should each have a second pinching. This is done about the middle of July.

Disbudding.—After the second pinching each lateral will put out laterals of its own. All of these, except four to five or six per plant, depending on the individual vitality of each plant, should be removed. Those laterals that have been left will start showing buds about the middle of August. This bud is generally known as a second crown bud and will first be seen as a pair of "rabbit ears" surrounded by a vegetative growth or other laterals that will in turn form the terminal buds if not removed. Do not let this growth go too long before removing or it will by-pass the second crown bud and blast it. "This second crown bud has proven to be the best to save in this locality." After having selected the buds to have bloom, all other growths, at the leaf joints and sprouts out of the ground, should be removed as soon as they are large enough to handle.

Insects and Sprays.—Aphis is the most likely insect that will have to be kept in check, but a spraying every week or ten days should not only take care of aphis but other pests—worms, tarnish plant bugs, etc., that might have ideas. Vapatone, D-X, Red Arrow, Black Leaf 40, and some others are all good as sprays.

Watering.—During the very hot and dry weather of July and August the plants should be well watered so as to keep them in a good growing condition. A sprinkling of the foliage real early in the morning or late in the afternoon is also good. When the buds start to show color it is well to pay close attention to watering. The plants should not be permitted to dry out but, on the other hand, do not drown them.

The Pay-off.—By following this program and not going to extremes, there should be no reason why at blooming time you won't have some blooms that you will be real proud of and have your visiting friends admire.

Proven Varieties.—The varieties listed below have proved that they can grow in this locality. There are others that will bloom at about the same time and perhaps will also prove to be satisfactory.

Early varieties that can be planted in the ground and will bloom where planted with but little protection and no heat are the following:

Incurved: Butterball—yellow, Major Edward E. Bowes—pink, Mrs. H. E. Kidder—yellow, Silver Sheen—white, Watanabe—yellow.

Spider: Georgina Hedinger—pink, Anne—white.

Later varieties that will bloom October 20–30 are the following. These can be grown in the ground or in pots and can be either moved or some temporary protection erected around them so that heat may be used in case of a below-freezing drop in temperature.

Incurved: Bronze Nerissa—bronze, Dame Enid Lyons—white, Fern Edwards—lavender-pink, Indianapolis White, Pink, Bronze, and Yellow, Lilian Foltz—yellow, Mrs. David F. Roy—red, Orchid Queen—pink and bronze.

Spider: Bertha Oliver—orchid pink, Bunbu—orchid pink, Marsha—white, Melody—yellow.

GROWING GREENHOUSE MUMS IN THE GARDEN

WILLIAM N. AVIS

Growing of some greenhouse varieties of mums in the garden was successfully accomplished this year by using black-cloth covering to reduce the daylight and thus induce early budding and early bloom. A bed 4 feet wide and 30 feet long containing 45 plants produced an average of six good blooms per plant or approximately 270 blooms. Varieties used were all from the early-flowering group, including WHITE CHIEF, INDIANAPOLIS YELLOW, GOLDEN SCEPTRE, BLAZING GOLD, MRS. H. E. KIDDER, and MAJOR EDWARD E. BOWES, all I. C. Decorative. Some of the Spider varieties were: PEGGY ANNE HOOVER, SUNNYSLOPE SPLENDOR, ALBERT WITT, WHITE, YELLOW and PINK RAYONANTE, MAMORU, MARY GARDEN, ARCTIC, MISS GINA HARWOOD, YELLOW LACE, etc.

Plants were propagated by rooting cuttings taken from stock plants carried over in a cold-frame. Cuttings were rooted in March in a home-made box equipped with fluorescent lights and potted in bands. They were moved to a cold-frame for planting in the bed about May 15.

The bed was prepared in advance by working in a 2-inch layer of manure and 5 pounds each of calcium phosphate and 80 per cent commercial muriate of potash per 100 square feet. Fertilizer was worked in to a depth of 4–6 inches. Plants were set out 18 × 24 inches apart and hard-pinched to about 7 or 8 inches high. After two weeks a high nitrogen liquid fertilizer was applied. Regular disbudding was practiced.

The bed was equipped with two strong pipe posts 6 feet high at each end and cross-bars for fastening wires to which the stems were supported by

strings. Above these wires two strong wires were placed for supporting the black shade cloth. The cloth is water-repellent and the type used by commercial growers. It must completely cover the plants, sides and ends, so that when drawn over the wires, all light is kept away.

The treatment was begun August 14, and by covering the bed at 6 P. M. and removing the cloth at 7 A. M. the daylight was cut to eleven hours. This schedule was maintained until September 2, when all plants had budded. Color was showing the third week of September and the prime bloom period was from October 5 to 20. The plants will not increase in height very much after budding. Many of the varieties were also grown in large pots and not treated for light curtailment but grown otherwise the same. These potted plants did not bloom until three or four weeks later than the cloth-treated plants, which was a good check on the value of the cloth treatment. The cloth was also used several times at night when there were light frosts.

The above method is the best the writer has devised after several years' trials, to grow this type of bloom in his garden, as it overcomes the obstacle of cold weather, which generally may start any time after October 20.

Several pots of cascade mums were grown. These were trained on a 4-foot piece of solid aluminum wire (12 gauge) by tying the stem every four or five inches. The wire was pointed at a 45° angle to north and was gradually bent north so that by September 15 it was parallel with the ground. Side shoots were pinched to induce branching. When buds were well formed the pot was taken from the ground and placed on a shelf with the wire facing south and bent further or completely removed. The buds will then face up for blooming. We have found cascade mums excellent to bring in the house and several lasted to December 1 on a shelf in our dining-room.

Mr. W. N. Avis of Webster Groves uses shading cloth for his mums.

A PIT HOUSE

GEORGE A. SCHAEFER

In my estimation the Chrysanthemum is one of the most beautiful and long-lasting flowers that can be grown by amateurs in their backyards. Many articles and books have been written about Chrysanthemums but the satisfaction you get from raising the delicate graceful Spider mums cannot be put into words. The exhibition varieties of mums require more care than the common hardy ones, as the blooms have to be protected from the wind and rain. At first the only protection that I used was a plastic cover; now my pit house, which is no more than a simplified greenhouse, is much better. The pit is 4 feet deep, 8 feet wide, and 10 feet long. The walls are of concrete blocks to just above the ground level, and the glass windows are set at a 45-degree angle to a crown board. The trap door on the east end protects the open steps and windows that swing open. The pit is easily ventilated; but the real advantage is that no elaborate heating system is needed and that the blooms can be kept in good condition until late November or early December.

Although I have made cuttings in the basement of my house with some degree of success, the ones made in the pit house last spring were healthier and made much sturdier plants. The plants were potted in 6- or 8-inch clay pots or 1-gallon tin cans and sunk into the ground in full sun. The

Mr. George Schaefer of St. Louis grows mums in a small pit house in his backyard.

mums must be disbudded, sprayed, and fertilized throughout the growing season for best results. When the blooms began to cup and show color they were moved into the pit house. By the middle of October most of the varieties were in full bloom, making a beautiful array of colors.

GROWING CHRYSANTHEMUMS FROM CUTTINGS

RALPH H. RABENAU

In growing mums I like to raise my own plants. I begin about April 1, by taking cuttings from stock plants wintered over in a cold-frame. I save part of the frame, about two feet square, for the propagating bed, laying two pieces of lumber about two feet long and 4 inches high in the front corner to hold the sand in the bed. The cuttings used are about 4 inches long with all but the top leaves removed. They are planted 2 inches deep in the sand and watered regularly. Fertilizer in liquid form, mixed according to the manufacturer's directions, will make the cuttings healthier and stronger. It will be necessary to provide shade to protect them from the direct sunlight. This is done by placing a muslin-covered frame over the propagating bed on top of the cold-frame sash, raising it about 6 inches at the rear for ventilation. A rooting preparation is used, as cuttings kept cool do not root as fast as those kept warm indoors; but they are much healthier and stronger, with enormous clumps of roots, and they can be potted with little or no shock as they are accustomed to the outdoor weather and a good deal of light. Cuttings rooted in this manner may be potted in the evening and left in partial sunlight for several days, and from then on in full sunlight with no damage other than a slight wilting.

All the cuttings are treated the same, whether of hardy types, early-blooming outdoor mums to be grown in beds, or the late-blooming varieties grown in pots sunk in the ground during the summer and taken to the porch when frost threatens. All cuttings are potted in 4-inch pots the first time, but from then on the treatment of each type varies. Some of the hardy types and the cushion mums are planted in their permanent places in the garden. I grow about 100 hills of Dahlias 4 feet apart, which gives space between the plants to grow mums in larger pots, to be moved into the border beds later in the season when the early-blooming flowers have finished. Tulips and daffodils may be replaced by hardy mums after their foliage has matured, as the mums are very shallow-rooting plants and do not interfere with the deep planted bulbs. These plants, for later use, are transferred from the 4-inch pots to 6-inch pots, and sunk to the rims between the Dahlias. They should be pinched two or three times to keep the plants low and bushy, and when moved to their places in the garden in July or August they will be compact and easy to shade for a few days until estab-

lished in their new locations. Some of the smaller plants can be kept in the pots and brought indoors when they are in bloom.

The early-blooming large-flowered greenhouse types, such as Mrs. H. E. Kidder, Silver Sheen, Major Edward E. Bowes, Morgan's White, Butterball, Celestra, etc., are grown in a bed which can be covered to protect the flowers from the rain after the buds show color, and from early frost. A convenient planting is a bed with the mums in three rows, 12 inches apart, with plants 12 inches apart in the rows. This requires a bed about four feet deep which can be worked from either side, and as long as you care to make it.

Mr. Ralph Rabenau of Lemay grows mums in a glass-enclosed front porch.

About June 1 to 15, 4-foot tomato sticks are driven at 12-inch intervals, and a plant placed beside each stick and tied securely to it about 6 inches above the ground. When the plant is 8 to 10 inches tall the tip should be pinched out to form laterals which will produce the flowers. Allow about six to eight laterals on each plant growing in the soil. Pot-plants cannot support as many flowers and produce acceptable size. Each lateral, as it develops, should be tied to the stake, as it is easily broken when it becomes long and has a large bud to support. All side growth should be removed from the laterals, and when the buds form, only one should be allowed to develop on each lateral. The first bud to form is called the crown bud, which will have four laterals developing rapidly just under it. These laterals must be removed very soon, as they develop rapidly and within a short time grow beyond the bud. When this happens remove the bud and all but one of the secondary laterals, in

order to keep the plant to six or eight flowers. The next bud to form will have four smaller buds around it where the laterals grew around the crown bud. I like to use the large center bud, called a terminal bud, and remove the four smaller ones and all the extra growth and buds which will form at each leaf on the stem. Try removing the center bud and allowing one of the side buds to mature on several of the laterals, as it will ripen a little later and may produce a better flower. Some varieties produce better flowers from crown buds, some from center terminal buds, and some from side terminal buds. Experience will tell you which buds to keep.

The late-flowering mums, grown in pots to bloom on the porch in late October and November, are transplanted from the 4-inch pots to 6- and 8-inch pots. Those in 6-inch pots are grown to one bloom for each plant, and those in 8-inch pots are grown to three or four blooms for each plant. The care of these potted plants is about the same as for the plants grown in beds except that the number of laterals allowed to grow is restricted more, and a cane or reed is used for support instead of the heavier tomato sticks.

The potting soil is made up of good garden soil, loose enough to drain so that water will not stand in the pots too long but not so sandy and porous that water runs through it like a sieve. The pots are sunk in the ground during the summer and are brought indoors on the porch as soon as frost threatens. A small pot placed in the ground under the drainage hole in the large pot will keep the plant from sending roots into the soil through the air space thus provided. This will lessen the shock when the plant is taken indoors. Even though roots have formed under the pot in the soil, the plant can still be moved indoors, but it will wilt considerably for some time after being taken in, if placed in the sunlight.

The soil for the beds of mums outdoors should be loose, fertile, and well-drained, and, if possible, raised slightly above the normal ground level. Water the plants regularly and fertilize lightly about three times—July 1, August 1, and September 1. Those plants grown in pots will need water oftener and should be fertilized on the 15th of each month, as well as the first, as soil nutrients will be leached out by the extra water needed for the plants. A mulch of rotted manure, 3–4 inches deep around the plants in beds, is very helpful and will cause the mums to produce much better plants and flowers. Spray as needed to control aphis during the spring and summer and at weekly intervals after the buds have formed to prevent them from getting a start in the opening blooms, as they are hard to control in the open flowers.

After the plants are brought indoors it will be necessary to water them every day, as a great amount of the moisture will evaporate through the porous pots allowing the soil to dry out rapidly.

This last season (1953) I was unable to care for the large-flowering mums

in the outdoor bed as much as is necessary, so they were allowed to flower in clusters with five smaller blooms on each cane instead of the usual one. Warm weather stayed long enough this past season so that even the later-blooming mums flowered outdoors as clusters, providing more cut flowers than it was possible to use. We grew tired of carrying them around before the season ended.

Some of the cluster-flowering varieties are grown for their color in the garden and as cut flowers. LILLIAN DOTY is a beautiful lavender that does exceptionally well and is reasonably hardy. A golden variety called GOLD COAST produced more good clusters of perfectly round pompons than any variety I have ever seen grown around St. Louis. When planted early and pinched three times each bush will produce 20 to 25 clusters of blooms on long canes. This variety is able to stand heavy frost without damage to the bloom.

After a killing freeze, the bushes are cut down and enough plants potted and stored in the cold-frame to provide stock for next season. Two pots of each variety are sunk to the rim in the soil of the cold-frames. The glass is put in place but is kept raised about 6 inches in the back to provide fresh air at all times except in extremely cold weather (zero degrees or less), when the sash is closed for the duration of the cold wave. It is excessive moisture rather than cold weather that kills most mums. One good plant will provide enough cuttings for the ordinary garden and some extras to pass around to friends, so the extra plant saved is for insurance just in case of an accident that may kill one of them. Those plants growing in the garden among the iris and over the spring-flowering bulbs are dug up in the fall and given away or destroyed as they multiply rapidly and will form a heavy mat of growth early in the spring that will interfere with the tulips and daffodils if the winter is not severe enough to kill them. Most of the mums will live outdoors over the winter if planted in well-drained soil and if the weather is no worse than it was last season (1952-53), but it is safest to use a cold-frame to save stock in case we do have severe cold weather with lots of rain and ice. The stock plants must be sprayed while in the cold-frame as aphis can damage the new growth severely. They must also be watered enough to prevent them from drying out through the winter, increasing the amount as spring approaches to encourage new growth. Cuttings can be made very early, but the plants will not bloom any sooner; therefore it is better to wait until later as the bushes will not get too tall if planted later and will be easier to control with less pinching.

For displaying Chrysanthemums in the home there is nothing quite as satisfactory as a cool entry porch or a sun-room. If the temperature can be kept ten to twenty degrees below that of the average living-room the plants will stay in flower much longer and the blooms will develop to maximum size.

THE MISSOURI BOTANICAL GARDEN

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SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden carries on the garden established by Henry Shaw over a century ago at "Tower Grove," his country home. It is a private institution with no public support from city or state. The old stone walls and cast-iron fences, the Linnean House, the Museum, the Mausoleum and the "Old Residence" all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's Day and Christmas) from 9:00 a. m. until 7:00 p. m., April to November, and until 6:00 p. m., November to April, though the greenhouses close at 5:00 p. m. Tower Grove, itself, Mr. Shaw's old residence, is open from 1 until 4. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., opposite the junction of routes 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

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COVER: Mrs. Emil Fisher (right) and Mrs. Reginald Bellville (left) pause to compare notes as 22 volunteer assistants fill, stamp, seal, and mail over 11,000 envelopes in one day to start the Friends of the Garden campaign. Mrs. Bellville is chairman of the secretarial committee of the Friends of the Garden volunteer workers. Mrs. Fisher, president of the Fenton Garden Club, has been one of several faithful assistants in recruiting efficient workers.—Photograph by Edward H. Goldberger.

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Missouri Botanical Garden Bulletin

Vol. XLII APRIL, 1954 No. 4

VOLUNTEER HELP AT THE GARDEN

Due largely to the efforts of our Horticultural Council an increasingly large number of St. Louisans are helping in various ways with the Garden's activities. Under the leadership of Mr. Dudley French of the Board of Trustees an active campaign to increase the "Friends of the Garden" is now in full swing. For some months groups of women from the Federated Garden Clubs have compiled mailing lists, checked addresses, and addressed thousands of envelopes. Finally, during the first week in April, 22 of them, working with Dr. Cutler and Mr. French under the direction of Mrs. Bellville (see cover picture), got all the thousands of envelopes filled, stamped, and sealed. Other groups have assisted in preparing thousands of cuttings of the Garden's Bulgarian Ivy, in cleaning the books in the library, in showing visiting delegations through the Garden, and in various other ways.

The Federated Women's Clubs have served as guides to Mr. Shaw's country home "Tower Grove," every day from 1 to 4 p. m., including Sundays and holidays. They made such an impression on one visitor that he has returned at regular intervals to shelve Mr. Shaw's personal library and to aid in restoring some of the old furniture. The Weeders and Seeders Garden Club has taken over the care of the grounds around Mr. Shaw's mausoleum, watching all the little details which will make the area look as if it were really part of a gentleman's garden. The St. Louis Garden Club has started to restyle and replant the area immediately behind the Old Residence. The charming little herb garden, paved and planted by the St. Louis Herb Society, grows lovelier every day, as the plantings and the background are extended and improved. The Men's Garden Clubs of this area are helping with better direction signs and a map to the grounds. Dr. Van Schaack's recataloguing of our excellent grass herbarium is now virtually complete. Leicester Faust has assisted with various executive problems. Other volunteers have begun a study of the weed flora of St. Louis and a general survey of the problems involved in maintaining and improving our marvelous collection of old botanical books.

One of our most helpful volunteer workers, Mr. Harry Collins, died suddenly in March. There will be a short notice of him and of the gifts to the Garden in his memory in an early number of the BULLETIN.

With the help of the Council it has been possible not only to find enthusiastic and able volunteers but to integrate their efforts into the Garden's operations. The use of these volunteer helpers has solved several problems. First, it has carried forward various projects which would have been impossible without extra help. Even more important, however, has been the way in which it has put the Garden in more direct touch with the community. We have learned about them and they have learned about us. We have enjoyed having these friends help us, and they give every indication of having had a good time while they were here.

PROFESSOR SPENCER'S TREATMENT FOR PHLOEM NECROSIS IN ELMS

For several years Professor E. R. Spencer, of Lebanon, Illinois, has been using common salt in the treatment of sick elm trees. Newspaper accounts of his experiments have stimulated interest in the possibility but, so far as we know, no conclusive tests of this treatment have yet been made. For those who may be interested in knowing about the salt treatment, or who may wish to try it out, Dr. Spencer has prepared the following short account of his method:

SALT AS A CURE FOR PHLOEM NECROSIS OF ELM

("We probably do not have enough information to make the statement at the heading of this, but several trees we feel sure had phloem necrosis have recovered their health when treated with salt, as stated below):

TREATMENT

"Use ordinary coarse salt, butcher's salt. For a large tree, use from 25 to 50 pounds; for small trees, from 10 to 15 pounds.

"Either make a trench a foot deep and the width of a spade around the tree out beyond the reach of the tree's branches; or punch holes a foot deep in the area beyond the reach of the branches, and if the area permits make enough holes to use the 25 pounds of salt with about a handful dropped in the bottom of each hole. If the area is as much as 100 feet wider than the spread of the tree, put these holes at intervals of 3 or 4 feet all the way out to the reach of the area. If the salt is placed a foot below the surface it will have no effect on the grass covering the lawn.

"Several trees have been treated in the two ways given. In every instance the dying of the top branches had started, and the troughing of the leaves indicated these trees had the phloem necrosis disease. These trees all recovered.

"If you have a sick tree, that is a sick elm, try this out. If it is the phloem necrosis disease I feel sure it will get well. If it is the Dutch elm disease I feel sure it will not be cured."

Signed,

E. R. SPENCER,
Consulting Botanist,
Lebanon, Illinois.

SEWAGE SYSTEM SLUDGE AS A FERTILIZER

AUGUST P. BEILMANN

At a time when all St. Louis County is involved in a proposal to install an adequate sewer system, it might be *apropos* to report on a little-known product of sewage disposal. Nationally we are intrigued by and proud of the excellence of our plumbing. But our interest does not extend beyond our own homes—we don't know what happens at the end of the sewer line! And perhaps that is much more important health-wise than the design of the chromium fixtures. No matter what kind of tile lines may be installed in the immediate future, eventually it will become necessary to treat all sewage to avoid converting even the larger rivers into common sewers.

Even now our major rivers are but little better than open sewers. They flow past our towns and cities and carry along all manner of industrial and domestic wastes. In 1888 Otto Widmann reported on the Winter Crow roost near St. Louis and described how the crows searched among the ice-floes for packing-house offal, which made up a major portion of their diet. So the practice of using the river as a sewer is not new! It is also a universal practice for a city through its water department to build an intake tower upstream; then treat the water so it is usable, and for the sewer department to discharge all sewers below the town. Fortunately, there is some dilution of wastes and some natural purification or the problems of the next town downstream would be insurmountable. But that town follows the same procedure—only stepping up the chemical treatment. Thus a particular gallon of water flowing down the Mississippi might conceivably have been drinking water and then sewage effluent several times on the way to the sea. Eventually, the water becomes so heavily charged with purifiers of one sort or another that a person unaccustomed to it finds it unpalatable or even causing intestinal disturbances. In the future we shall be forced to give serious thought to what can be done to treat sewage, so that a city, jealously guarding the health of the citizens within the corporate limits, does not create a state-wide health problem by using the nearest stream as a sewer.

Raw sewage has been successfully treated for some time. Perhaps the most notable example is that of Milwaukee, where all sewage, after being processed and reduced to solids, is marketed as a bland fertilizer called "Milorganite." Many other cities and towns follow a similar procedure, but few have been as successful in disposing of the dried solids after treatment. Sewage-treatment plants can be very simple—just an enlarged septic tank—or they may be very elaborate and costly and include drying and processing equipment. Sewer systems are laid to drain to a low point; here a sump is constructed and the disposal plant built nearby. The first step in the process

Sewage sludge being emptied directly into a spruce planting at the Arboretum

is the screening and grinding of all wastes and pumping them to the first digesting tank. Here bacterial action quickly reduces all solids which slowly settle and allow the excess water to be drained off and pumped through an aeration system where it trickles through a deep bed of graded gravel. The relatively clear effluent is then returned to some creek or river. This is the most simple procedure but many more stages and certain refinements can be added if necessary.

It is the decomposed solids, which settle and become the "sludge," with which we as gardeners and farmers are concerned. Actually, plant operators are no less concerned since very few "disposal plants" have any means of disposing of the sludge. In a city of 10,000 people this may amount to a considerable tonnage during a year. The author has experimented with "sludge" as a fertilizer for over fifteen years, beginning with the dried material from the Kirkwood, Mo. plant and finally devising a way of hauling and distributing the liquid sludge. At the Arboretum, only the liquid form has been used, and this has been taken directly from the "digester" at the Pacific, Mo. plant. In all, about 154,800 gallons have been used as fertilizer.

Disposal plants are generally provided with drying basins. The digested sludge is discharged into a basin filled with a deep layer of graded sand and gravel. The water drains away and the dried mud-like sludge can then be

picked up with a shovel and hauled to the field. We have found this to be the most costly way of hauling and distributing the material. For some years we have used a tank truck. This requires the use of a diaphragm pump (mounted on the truck) which is connected to a pipe line from the digester and transfers through a 3-inch hose directly to the tank truck. Both loading and unloading are quickly accomplished without direct contact with the material. When filled, the truck is driven directly to the field or to a tree plantation. The valves are then opened and the sludge is allowed to cover the ground to a depth of several inches. If the slope is not too steep or if a heavy mulch is present, it is possible to build a very fertile top-soil almost as soon as the excess water drains away. During the drying period some odor is noticeable, but it is not objectionable and lasts but a short time.

In a rather widespread and general use of sludge we have encountered no difficulties. The material has been applied directly to field corn, to grass, winter wheat, and rye. It has been used in plantations of pine, spruce, hemlock and holly; to crabapples, strawberries, and to flowers grown commercially for cutting. Without exception, it has proven a superior fertilizer when used in sufficient quantity. While a detailed analysis might be obtained, experience indicates that pound for pound it is worth about half as much as most commercial fertilizers. Because of our experience we feel that we might offer a few suggestions to builders and designers of such plants. First of all, more attention should be given to the method and manner of removing the liquid sludge. Second, major sanitary sewer lines should be tight pipe; not open-joint clay tile. During rainy periods the additional water entering the tile from the saturated soil imposes an unanticipated load, and it may carry along enough clay to complicate sludge removal. Debris and trash should be screened out at the intake. Even 3-inch pipe and valves become clogged, and a uniform distribution of the liquid sludge is impossible. The tanks should be covered with screening and the plant fenced so that debris cannot be thrown into the system.

"Sludge" from a sewage-disposal plant is a modernization of the night-soil of much older civilizations than ours. It has demonstrated its value through the maintenance of sufficient fertility to feed dense populations. Organic wastes have always been returned to agricultural lands, but in "sludge" we have an innocuous material, quite free of diseases, almost without odor and easily handled. It should be gathered and processed then returned to our gardens and farms. The raw sewage should not be emptied into the nearest river to create an endless problem. Clear, potable water can become our most precious resource—the past dry summers have driven that home in many parts of the Middle West.

CONTROL OF DEER DAMAGE TO WOODY PLANTS AT THE ARBORETUM

LOUIS G. BRENNER

The browsing habit of deer is not considered to cause a great amount of damage. Such herbaceous plants as the Purple Coneflower *(Echinacea pallida)* and the Rosin-weeds (*Silphium* spp.) are eaten, and some ornamental shrubs as Rhododendrons and the Mountain Laurel *(Kalmia latifolia)* are often so completely defoliated and new growth so reduced that the plants are several years in recovering. Sometimes in the nursery seedlings are seriously cut back and growth retarded by browsing. The greatest damage at the Arboretum, however, is to woody plants during the fall and early winter when the buck deer rub the "velvet" from their antlers and polish and sharpen the "points" in preparation for the mating season. For this strange "toilet" a small tree, usually about 1–1½ inches in diameter, is selected on which they rub their antlers with a vigorous up-and-down motion, peeling the bark from the stem and breaking off limbs as well. Plants with an aromatic inner bark, as the conifers, Gingko, Sassafras, are especially favored and suggest a peculiar masculine vanity among deer. Coarse, scaly-barked trees as the oaks and western pines are seldom bothered, since deer seemingly prefer the thin, tender-barked trees.

It has been found that nursery-grown stock have much in themselves to do with inciting deer damage. Such plantings are for the most part made at regular intervals and usually on open sites to permit maximum light and room for growth. Maintenance customarily includes clean mowing about the trees to control invasion by seedling forest trees and brush. Such conditions seem particularly inviting to buck deer which seem reluctant to move into areas where immediate retreat in any direction is not possible and from which danger may not be readily sensed. Removal of brushy growth surrounding wild flowering shrubs and trees to permit more rapid growth of the plant tends to create the same possible dangers of deer rubbing.

Experience has shown that almost any small conifer may be rubbed on until it reaches the height of 5–6 feet. After that the stiff branches of certain species such as the Tiger-tail Spruce *(Picea polita)*, White Spruce *(Picea glauca)*, and the Colorado Spruce *(Picea pungens)*, discourage this practice. Pines, as the White Pine *(Pinus strobus)*, spruces, especially Norway Spruce *(Picea abies)*, and the firs may be rubbed against until the tree trunks are as great as 3–4 inches in diameter, since their lower branches are not stout enough to prevent the animals from pushing their way in toward the trunk. Rubbing then has the effect of girdling the tree causing serious damage if not death.

Extensive ravages by deer at the Arboretum, where there is an unusually high population of these animals, has warranted several methods of protecting

Saucer Magnolia *(Magnolia soulangeana)* wired to prevent "rubbing" by buck deer.

woody plants where applications of repellent sprays have proven ineffectual. Because the buck deer are reluctant to engage their antlers into anything that may entangle them the simplest form of protection has been through the use of barbed-wire fencing. A most effective means of safeguarding small evergreens is fashioned by winding a single strand of the wire in a spiral manner about the tree, beginning at the base and laying the wire loosely on the outer branches. Three or four turns about a tree 3–4½ feet is sufficient, and usually requires a strand of wire 12–15 feet long. The wire is wound from the base to the uppermost limbs of the tree. This method is also used for shrubs, as the shrubby types of Magnolia *(Magnolia soulangeana* and *M. stellata)*, on which deer are especially fond of rubbing (see illustration). It has been found necessary to protect even the larger Magnolias at the Arboretum and in these only the lower 4–5 feet of branches need have the strands of wire laid onto them.

Since deer have a pronounced roving habit and are prone to assume a direction of travel having least obstruction, effective protection against them is sometimes gained by stringing a single strand of barbed-wire on posts around an entire group of plantings. The strand of wire in this case should be about 3½ feet above the ground. This means of protection, however, is suited only for the smaller more compact groups, 3–5 trees, since the deer may jump over or slip under the wire where larger groups are fenced.

Clean unbranched trunks of trees as the Cucumber Tree *(Magnolia acuminata)*, Beech (*Fagus* spp.), Maidenhair *(Ginkgo biloba)*, and Bald Cypress *(Taxodium distichum)*, etc. may be rubbed by deer even though the trees may be as great as 4–5 inches in diameter, and need protection up to at least 4 feet above the ground. For these, the trunk may be wrapped with 2–3 inch mesh poultry netting, wound spirally with barbed-wire with the wrappings about 6 inches apart; or several stout stakes may be driven in the ground around the tree, and the barbed-wire wound about them to form a small enclosure. Though somewhat unsightly, the latter is the more preferred form of protection since the trunk is permitted to expand freely in growth and annual readjustment of the protecting wire is eliminated.

Evergreen shrubs, as Rhododendrons (especially *Rhododendron maximum* and *R. mucronulatum*), Mountain Laurel *(Kalmia latifolia)*, and trees, as Hemlock *(Tsuga canadensis* and *T. caroliniana)* and the Arborvitaes *(Thuja occidentalis* and *T. orientalis)* which may be both browsed on and rubbed against should be protected until they are at least 5–6 feet high with 4-foot poultry netting fences. Rhododendrons and Mountain Laurel need permanent fencing in areas where deer resort in extremely cold or icy weather.

A DEVICE FOR SWEEPING LEAVES FROM TRAILS

LOUIS G. BRENNER

The six and a half miles of service trails through the woodland areas of the Arboretum have long presented a problem—that of raking off the leaves. Unless the leaves are removed the trails may not function effectively as fire-breaks, and furthermore a thick mat of leaves left on the trails may become so wet during rainy reasons that deep ruts result. Formerly, the leaves were raked off by hand, a time-consuming and, needless to say, expensive operation. Despite the day and a half or two days spent by a crew of two to three men, only those parts of the trails where leaves laid heaviest were able to be raked clean. The development of the device illustrated below has made annual sweeping a practical and economical operation and has made it possible to sweep the entire trail system in a day and a half, rendering the trails effective as firebreaks as well as improving the appearance of the whole wooded area.

The "Trail Sweeper" using high-pressure fog to blow leaves from a stretch of trail at the Arboretum.

A trailer-type tree-spraying tank equipped with a high-pressure pump operating at 600 pounds per square inch pressure was used. To the rear of this was attached the fog-type spray-guns, also used for tree-spraying, in such a manner that the spray-guns blew toward opposite sides of the trail. To be effective, it is necessary that the guns be arranged so as not to blow directly into each other. With the nozzles adjusted to a medium fog stream it was found possible to sweep away even those leaves matted down by vehicle wheels, as well as twigs and smaller branches. The equipment was found to be most efficient when the leaves are only slightly dampened. If the leaves are extremely dry they tend to drift back on the trail especially if there are light breezes during the sweeping operation. Very wet leaves are too heavy to be blown aside. When operated under proper conditions the blast of air and water spreads the leaves evenly on either side of the trail, leaving the woods with a natural appearance and without the unsightly piles of leaves that result from raking by hand.

Flora of Bedfordshire. By John D. Dony. 532 pp., 25 pls., 22 figs. Luton Museum, Wardown Park, Luton, England, 1953. £2 2s. ($5.88).

This recent British County flora is of special interest to botanists of this country as an outstanding example of a detailed local flora. Bedfordshire is a county of some 470 square miles (slightly smaller than St. Louis County) and it displays a considerable diversity of soils and habitats. In addition to the list of flowering plants and ferns with detailed locality records and habitat notes there is a section on mosses and one on fungi, groups not often included in a floristic work.

Close attention is paid to the status of the species, whether native or adventive. This is of particular importance because of the long history of extensive land use in the county and the present very high percentage (75 per cent) of land devoted to farming and urban use. An additional 22 per cent is in pasture. Special problems of the adventive flora are wool-waste weeds, railroad colonists and the rock-wall flora. The last particularly is of interest as primarily composed of species native to Britain but occurring in the county only on this man-made habitat. A separate list is appended of species that are not admitted to permanent membership in the flora.

The most unusual feature of the book is the ecological studies of selected habitats. Eighty-six of these studies present a good sampling of the vegetation types and they will be valuable in future studies of changes in the flora. The history of botanical activity, begun in 1597, shows the interest in the local flora of more than 250 persons. This long and active study has enabled Dr. Dony to prepare a work of detailed scope that will be a useful reference, and something of a model, for botanists in this country.—R.M.T.

THE ARBORETUM—A "VEGETABLE PLATE" FOR DEER

LOUIS G. BRENNER

Visitors have always expressed much interest in the rather large herd of White-tailed Deer that have taken residence in the 1600 wild and semi-wild acres of the Arboretum. The White-tailed Deer, so called because of the conspicuous white under part of the tail which is shown as the animal "high-tails-it for the brush," usually withdraw to one of the many brushy areas or deep wooded valleys to loaf as the sun rises high in the sky, and the best chances to see them are early or late in the day, or on clouded days. As a rule, the question "What do they eat?" comes forth whenever conversation turns to the deer. The following is an account of the feeding habits of the White-tailed Deer at the Arboretum and is based on observations in the field and on study of browsed plants.

On-the-spot observations of the deer's food preferences were made with the use of binoculars, after which the plants were checked for specific identification. Extensive notations were also made in the field of plants browsed over by deer, thus giving a fairly accurate summary of the food plants of the animals. Chiefly they snip tender shoots and buds of plants as they rove about, seldom lingering more than a few minutes in any area. Such a feeding habit is very unlike that of cattle which methodically progress through a pasture, grazing entirely upon herbaceous plants. Unlike cattle, too, which may resort to feeding on tender shoots of woody plants only when there is insufficient plant material, deer include large quantities of tender woody shoots in their diet. It is easily seen, then, that deer's diet will include a large assortment of the plant species listed in the table below. It is also to be expected that deer create serious problems in an area devoted to growing a multitude of plants for botanical purposes. Fortunately, the deer snip only the tender new shoots on woody plants, resulting merely in retarding growth and sometimes in reducing flowering or fruiting wood. More serious problems arise with herbaceous plants, especially annuals, where loss of the new growth and also the flower-heads may seriously affect reproduction.

There are two very desirable wild flowers which are threatened with extinction because of deer. The flower-heads, and especially the ripening seed-heads, of the Purple Coneflower *(Echinacea pallida)* and the Rosinweeds *(Silphium* spp.*)*, both showy plants of the glades, are snipped from the plants annually and in great quantity. Examination has shown that the seed-heads contain a great amount of pungent oils which present a juicy morsel to the deer. To insure perpetuation of these plants, it is necessary to collect an abundance of the seed-heads before they are completely stripped by the deer and then sow them on the glades.

Deer also present serious obstacles in introducing new herbaceous plants

in the Wildflower Preserve of the Arboretum. For instance, repeated efforts to introduce the Large White Trillium *(Trillium flexipes)* have met with equally persistent snipping of the broad succulent leaves by the deer. The tuber of the plants finally become so depleted of food that the plants seldom persist past the third year. Perhaps the new plants added to the otherwise stable flora present a dainty "salad" to the deer.

Although the deer have caused considerable damage to valuable wild flowers, let us look at another and possible balancing factor. The Sow-thistles (*Sonchus* spp.), formerly noxious weeds which rapidly invaded any tilled or disturbed soil area about the Arboretum grounds, have been so greatly reduced by the deer continually feeding on the new growth and seed-heads that the plants are no longer a pest. The presence of a rather high deer population has proven a distinct advantage, too, in the forest areas where such weed trees as the elms *(Ulmus fulva* and *U. americana)* and

The Sow-thistle (*Sonchus* sp.), a good example of the effect of deer browsing. Note that repeated nippings have caused a much-branched habit and though many more flower heads are produced as a result these seldom have opportunity to mature to seed. The plant is normally wand-like with a few flower-heads at tip of stem.

Honey Locust *(Gleditsia triacanthos)* are often cut to permit more rapid growth of desirable trees. Deer are fond of the tender shoots of the elms and Honey Locust and regularly visit the newly sprouted stumps to browse, making the use of herbicides for stump sprouts unnecessary in these areas. The decided preference by deer for certain plants may account for peculiar growth habits. Repeated browsing often results in interesting "sheared" forms, particularly of stump sprouts growing vigorously on more open sites.

Deer are extremely fond of acorns, particularly those of the White, Red, and Black Oaks *(Quercus alba, Q. borealis, Q. velutina)*, and during good mast years they form the greater part of their diet. The acorns are taken whole, often with the cup attached, without mastication. Deer are also very fond of the fruits of Wild Cherry, Wild Plum, Pawpaw, and Persimmon.

It is of particular interest that at no time have the deer browsed to any appreciable extent on the many Boxwoods *(Buxus sempervirens, B. microphylla)* planted about the grounds. The Narcissus, containing a strong toxic factor, remain untouched. However, early attempts to establish the showy Regal Garden Lily *(Lilium regale)* on the grounds were met with failure. Their succulent shoots, much like an Asparagus tip, have proven too tempting a morsel for deer in spring. Repeated browsing on the evergreen Rhododendrons (especially *Rhododendron maximum*) and the Mountain Laurel *(Kalmia latifolia)* has made the growing of these shrubs impractical without protection of woven-wire fencing. No serious damage has been caused to crops grown for test or feed at the Arboretum where there is other abundant food available. However, attempts at vegetable gardening by the resident Arboretum personnel have been particularly frustrating, for the deer have proven extremely fond of garden peas and beans, with little regard for variety. Carrots and beets have first the tops nipped off and then the roots pawed from the ground, but tomatoes are seldom touched. Fences prove useless against these agile raiders which may easily clear a 7-foot fence, and only the vigilance of a watchful dog has been found effective.

The deer in the Arboretum grounds seem to delight in the numerous "openings" made in the woods and brush to permit planting of native and exotic trees, shrubs, and wild flowers. Such openings have increased the number of herbaceous plants important in the diet of deer. Thinnings in the forest areas have favored increased mast production. Widespread use of fertilizers and mulches, an effective erosion control, and water conservation program, all necessary in the develpoment of the Arboretum, have also prepared a natural habitat with a rich flora capable of sustaining an abundance of wildlife even through climatic extremes.

SOME OF THE MORE IMPORTANT DEER FOODS AT THE ARBORETUM

NATIVE HERBACEOUS PLANTS

Name	Common Name	Part of plant eaten
Ambrosia trifida	Giant Ragweed	New growth
Ambrosia artemesifolia	Prairie Ragweed	New growth
Amphicarpa bracteata	Hog Peanut	New growth
Antennaria plantaginifolia	Ladies' Tobacco	All
Antennaria neglecta	Ladies' Tobacco	All
Asclepias spp.	Milkweeds	New growth
Aster spp.	Asters	New growth
Campanula americana	Tall Bellflower	New growth
Cassia fasciculata	Partridge Pea	New growth
Claytonia virginica	Spring Beauty	All
Desmanthus illinoensis	Prairie Mimosa	New growth
Desmodium spp.	Beggar Ticks	New growth
Echinacea pallida	Purple Coneflower	Flower bud, seed-head
Elymus spp.	Wild Rye	All
Erythronium albidum	Trout Lily	All
Galactea volubilis	Milk Pea	New growth
Helianthus spp.	Sunflowers	Flower bud, seed-head
Impatiens bicolor	Spotted Touch-me-not	All
Impatiens pallida	Pale Touch-me-not	All
Lespedeza spp.	Lespedezas	All
Liatris scariosa	Kansas Gayfeather	Flower spike in bud
Lilium michiganense	Turks-cap Lily	All
Parthenocissus quinquefolia	Virginia Creeper	New growth, leaves
Phlox virginica	Wild Phlox	New growth
Polygonatum canaliculatum	Solomon's Seal	All
Ratibida pinnata	Prairie Coneflower	Seed-head
Rudbeckia spp.	Black-eyed Susan	Seed-head
Silphium spp.	Rosinweeds	Flower bud, seed-head
Trillium spp.	Wake-robins	All
Sonchus spp.	Sow-thistles	New growth, seed-head
Strophostyles spp.	Trailing Wild Beans	New growth, seed-pod

NATIVE WOODY PLANTS

Campsis radicans	Trumpet Creeper	New growth, flowers
Celtis spp.	Hackberry	New growth
Cercis canadensis	Redbud	New growth, green pods
Cornus spp.	Dogwoods	New growth
Diospyros virginiana	Persimmon	New growth
Euonymus atropurpurea	Burning Bush	New growth
Fraxinus spp.	Ash	New growth
Gleditsia triacanthos	Honey Locust	New growth
Hydrangea paniculata	Hydrangea	New growth
Ilex deciduа	Deciduous Holly	New growth
Juniperus virginiana	Red Cedar	New growth
Populus deltoides	Cottonwood	New growth
Quercus spp.	Oaks	New growth
Rhus spp.	Sumac	New growth
Salix spp.	Willow	New growth
Sassafras officinale	Sassafras	New growth
Symphoricarpus vulgaris	Buckbrush	New growth
Ulmus spp.	Elm	New growth
Vitis spp.	Grape	New growth
Zanthoxylon americanum	Prickly Ash	New growth

NATIVE FRUITS

Name	Common Name	Part of plant eaten
Asimina triloba	Pawpaw	Fruits
Diospyros virginiana	Persimmon	Fruits
Ilex decidua	Deciduous Holly	Fruits
Prunus serotina	Wild Cherry	Fruits
Prunus am ricana	Wild Plum	Fruits
Quercus alba, Q. borealis, Q. velutina, Q. macrocarpa	Oaks (White, Red, Black, and Bur)	Fruits
Rhus copallina	Shining Sumac	Fruits
Rubus spp.	Blackberry	Fruits
Symphoricarpus vulgaris	Buckbrush	Fruits
Viburnum rufidulum	Black Haw	Fruits
Vitis spp.	Wild Grape	Fruit

ORNAMENTAL PLANTS

Albizzia julibrissin	Tree Mimosa	New growth
Cephalotaxus fortunei	Chinese Plum-yew	New growth
Kalmia latifolia	Mountain Laurel	New growth
Larix spp.	Larch	New growth
Magnolia spp.	Magnolia	New growth
Nandina domestica	Nandina	New growth
Rhododendron spp.	Rhododendron, Azalea	New growth
Taxus baccata, T. cuspidata	Yew	New growth
Thuja occidentalis	American Arborvitae	New growth
Thuja orientalis	Oriental Arborvitae	New growth
Tsuga canadensis	Hemlock	New growth
Tsuga caroliniana	Carolina Hemlock	New growth
Ilex latifolia, I. opaca	Holly	New growth
Euonymus spp.	Burning Bush	New growth

THE GARDEN AND THE ARBORETUM IN MAY

The dramatic Easter Show, planned and executed under the direction of Mr. Paul Kohl, will continue in the Floral Display House until early in May, with a series of replacements as the season advances. On May 22 and 23 the Greater St. Louis Rose Show will be held in the Floral Display House and will be open to the public. Out of doors the Perennial Garden around the Linnaean House and the adjacent Rose Garden will be in good bloom for most of the month. In the Mausoleum grounds near Mr. Shaw's residence, "Tower Grove," the display of Wood Hyacinths should be at its best about the first week in May. At the Garden's Arboretum (Gray Summit, Missouri) the wildflower trails through the Glade area will be increasingly beautiful, reaching their climax in early to mid-June with the gigantic yellow flowers of the Missouri Primrose. Last year's drought, by discouraging the growth of grass, has encouraged some of the more interesting wild flowers.

NOTES

The annual flower sermon, provided for in Henry Shaw's will, was preached at Christ Church Cathedral on April 25, by the Rev. Richard H. Wilmer, Chaplain, Yale University.

Mr. George H. Pring, Superintendent of the Garden, as one of the trustees of the American Orchid Society, attended the quarterly meeting held on February 27 at Miami, Florida, at which final arrangements were made for the first World Orchid Conference to be held in St. Louis, October 15–17, under the auspices of the American Orchid Society with the cooperation of the Missouri Botanical Garden and the Orchid Society of Greater St. Louis.

The naturalized plantings of daffodils at the Garden were at the height of their bloom during the first week in April, and the display was so striking, especially along Magnolia and Alfred avenues, that motorists would stop their cars to admire them. After two hot days (April 5 and 6) and a good rain, many flowering trees and shrubs—magnolias, redbud, flowering crabs, plums, flowering peach, etc.—literally "burst" into bloom, and the color effect in the Garden was almost breath-taking.

Mr. G. H. Pring, Superintendent of the Garden, Mr. G. R. Lowry, in Charge of Orchids, and Mr. John E. Nies, Chairman of the Horticultural Council, attended the annual Tennessee Capital Orchid Show, at Nashville, March 13–15. Mr. Pring acted as chairman of the judges and as commentator of the Orchid Symposium. A collection of Garden orchids featuring Dendrobiums was staged by Mr. Lowry and occupied 100 square feet. Although the exhibit was not in competition, it received a special award.

Recent visitors to the Garden library and herbarium include: Mr. Ralph W. Emons (former graduate student at the Garden), of the Antibiotic Division, Charles Pfizer & Co., Brooklyn, N. Y.; Sister Mary Aloyse Ellingson, of the Loretta Academy, Kansas City, Mo.; Dr. M. Truffant Hall, of the Cranbrook Institute of Sciences, Bloomfield Hills, Mich.; Dr. E. Lucy Braun, of the University of Cincinnati; Dr. William L. Brown, of the Pioneer Hi-Bred Corn Co., Johnston, Iowa; Mr. R. A. Evers, of the Illinois Natural History Survey, Champaign; Mr. Franklin Lane and Donald A. Larsen, of the University of Illinois, Urbana; Prof. Charles B. Heiser, of Indiana State University, Bloomington; Prof. Taizo Inokuma, of the Institute of Forest Botany, University of Tokyo, Japan; Dr. Robert W. Schery, of Scott Seed Co., Marysville, Ohio; Mr. Arthur Smith, of Campbell-Smith Co. Greenhouses, Boone, Iowa; Dr. Ledyard Stebbins, of the University of California, Berkeley, en route to a year's study in the Mediterranean.

THE MISSOURI BOTANICAL GARDEN

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SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden carries on the garden established by Henry Shaw over a century ago at "Tower Grove," his country home. It is a private institution with no public support from city or state. The old stone walls and cast-iron fences, the Linnean House, the Museum, the Mausoleum and the "Old Residence" all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's Day and Christmas) from 9:00 a. m. until 7:00 p. m., April to November, and until 6:00 p. m., November to April, though the greenhouses close at 5:00 p. m. Tower Grove, itself, Mr. Shaw's old residence, is open from 1 until 4. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., opposite the junction of routes 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

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COVER: The Collins Fringe Tree, with a ball of 4½ tons of earth, being moved from its old site in University City. (See p. 100). Photograph by Trifon von Schrenk.

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Missouri Botanical Garden Bulletin

Vol. XLII MAY, 1954 No. 5

THE GARDEN'S MOST IMPORTANT CROP

EDGAR ANDERSON

Some of the work which goes on here at the Garden is well appreciated in St. Louis. The averagely well-informed St. Louisan has heard about our water-lilies and our orchids; he knows of Mr. Kohl's talent in designing chrysanthemum and other flower shows which are both spectacular and in the best of taste; he has read about the important work in conservation being carried on at Gray Summit by Mr. Beilmann and his staff. One of our most important activities, however, he is usually quite unaware of. This work goes on all the time but the results are usually not visible until after some years. Yet it concerns what is really our most important crop and the one of all our activities which results from the most careful planning on Mr. Shaw's part. The crop is young botanists, the young men and women who spend from one to five years at the Garden and eventually depart with a Master's or Doctor's degree from the Henry Shaw School of Botany of Washington University.

These young people have gone out into the world and made names for themselves but their work is done all over the globe, and word of their success seldom filters back to the Garden's own particular public in St. Louis. Here are two clippings which came back to us not so long ago, one from the *Chicago Tribune*, the other from a Los Angeles newspaper. Both of them are about boys from the Greater St. Louis area, trained in the Henry Shaw School of Botany, who went away and made good. We plan to call the public's attention from time to time to such stories. In any one year there are only a few young people working in the laboratories at the Garden. But for over half a century this crop of just a few a year has gone on decade after decade. The graduates now constitute one of the Garden's most outstanding accomplishments and one of which Mr. Shaw would justly be proud. The first story is about Dr. Julian Steyermark. It appeared in the *Chicago Tribune* in Richard Orr's column "Day by Day on the Farm."

Day by Day on the Farm

By RICHARD ORR

Within an hour and a half of the Loop by auto is one of the most unique nature preserves in the midwest. It is a private, four acre wooded tract surrounding the home of Dr. and Mrs. Julian A. Steyermark, 5 miles north of Barrington.

Dr. Steyermark is curator of the herbarium at the Chicago Natural History museum. In his small preserve can be found more than 1,000 species of wild flowers, shrubs, trees, ferns, and other forms of plant life.

Most are native to Chicagoland, but many have been transplanted from the southeast Missouri Ozarks and from southern and southeastern states. In the preserve you can see one of the rarest flowers in the world—the spicy, fragrant, pale pink to lavender blooms of the Kankakee mallow. This hollyhock-like plant grows wild in only one place—an island in the Kankakee river.

Plant Rates as "Relic"

Botanists call this plant a "relic," which means it has lost its capacity to spread, either because of severe competition from other plants or because of something in its nature.

Another uncommon resident of this tiny plant wonderland is a type of grass that is native to China, Japan, and Korea and does not have a common name. It is a plant of fragile beauty that lifts feathery plumes four feet high or more and is known to botanists as miscanthus sacchariflorus. There is said to be a colony of it near Glen Ellyn, one of two places in the United States [Iowa is the other] where it grows regularly.

Growing nearby is New Jersey tea, a low shrub that produces fragrant white flowers. American colonists made their tea from this plant after they refused to buy it from the British.

Elsewhere is another small shrub called Leatherwood, which has such supple wood that the Indians used it as twine for sewing and for tying bundles. This is a native shrub, now rare, which blooms with small yellow flowers in early spring.

There's Cork Tree

There is a specimen of the cork tree, a small tropical species native to southeastern United States. It produces the lightest wood of any tree in this country. And there are a few small seedlings of the American chestnut, a species all but wiped out by blight a half century ago.

Wildflowers bloom from early spring to late autumn in this preserve. As many as 80 species may be found in flower at one time in autumn and more than 140 on some May and June days.

When we visited it recently, several kinds of gentians, native flowers once abundant but now rare, were blooming. They included the bluish purple fringed gentian, one of nature's most beautiful creations; the rose gentian, the violet colored downy gentian, and the bottle gentian, which never opens its vivid blue flowers.

There are a dozen kinds of sunflowers, nearly 20 kinds of wild asters, and several types of prairie grasses that were abundant when the pioneers arrived but are plentiful no longer.

A unique aspect of this preserve is that six types of natural conditions have been created within its four acres—dry upland prairie; swamp; dry upland oak and hickory woodland; rich, low woods and wooded ravines; low, swampy meadow, and a miniature replica of the rocky glades of the Ozarks.

The story from Los Angeles is entitled "Jungle Explorer has Command of Arboretum." It is doubly interesting to most of us on the Garden staff because Dr. Seibert got his wife as well as his technical training at the Missouri Botanical Garden, having married Isabelle Pring, the daughter of our superintendent.

Jungle Explorer Has Command of Arboretum

An Illinois farm boy who grew up to be a jungle explorer is directing development of one of the world's most ambitious horticultural plans, the Los Angeles State and County Arboretum in Arcadia.

"It will be more than a park, you know," Dr. Russell J. Seibert, director of the Arboretum, said. "It's going to be an educational and research center."

The 36-year-old director was one of the key men in the race to find adequate supplies of natural rubber in the Americas, surveying Panama, Costa Rica, Venezuela, Colombia, Haiti, Bolivia, Peru and the Amazon Valley of Brazil.

From his and others jungle research came U. S. Department of Agriculture collections of different rubber varieties and knowledge of rubber so that supplies of raw rubber could be increased in the Western Hemisphere.

Born in Belleville, Ill., Dr. Seibert did his undergraduate work at Washington University, St. Louis, and Illinois University, taking post-graduate work at Washington University's Missouri Botanical Garden and Arnold Arboretum at Harvard.

He joined the Department of Agriculture staff in 1940, as preparations to meet anticipated rubber shortages were made. For eight months he surveyed six South and Central American countries and Caribbean Islands. Then he was sent to Marfranc, Haiti, to establish a departmental rubber test

station. A collection of rubber plants from the Philippines was propagated and plants were distributed for test growing.

From this work disease resistant rubber plants adaptable to the South and Central American countries were developed—plants which today assure the United States of enough natural rubber when the supply is supplemented with synthetic rubber.

After further training in Washington, D. C., and Florida, Dr. Seibert returned to South America to search the jungles of Peru, Bolivia and Brazil for promising rubber plant specimens. The samples were grown at small nurseries then flown out to experimental stations. Later he served at one of these stations at Turrialba, Costa Rica.

Dr. Seibert was in charge of the rubber plant breeding program at Beltsville, Md., when he was invited to become the Arboretum's new director last June.

In his new job he still has a jungle to explore: the Arboretum's lagoon and forest which have been the scene of many Tarzan movies. And he has the further challenge of collecting not one plant but every type of plant on earth which might grow in Southern California. These exotics will be grown on the 111-acre grounds, once the home of Lucky Baldwin. They will be improved for Southland gardens, then made available to home gardeners.

"I hope, as the Arboretum's development progresses, we will gain the support of every person interested in plants," Dr. Seibert said. "The county has agreed to finance the capital improvements, but the planting program, which will start soon, will have to be financed by private donations."

With his wife, Isabelle, and three children, Michael, Donna, and Lisa, Dr. Seibert lives at 605 Hyland, Arcadia.

FIELD MARSHALL SMUTS' COLLECTIONS REACH GARDEN HERBARIUM

Among a large collection of specimens of South African plants recently sent to our Garden herbarium by the National Herbarium of the Union of South Africa at Pretoria are a number of plants collected by the late Field Marshall Jan Christian Smuts, one-time Premier of South Africa and world statesman for over half a century. It is not generally known that Field Marshall Smuts also was a very active and accomplished botanist. The specimens from Pretoria were sent in exchange for a series of photographs of type specimens of South African plants provided by the Missouri Botanical Garden.

DR. WOODSON'S SEVEN MEDITATIONS

The Curator of the Garden's herbarium, Dr. Robert E. Woodson, Jr., is a scholar with a gift of self-expression and a charming sense of humor which is not as well known to St. Louisans as it ought to be. Last year he was president of the American Society of Plant Taxonomists; his presidential address at Madison, Wisconsin, was a masterpiece which will not be forgotten by any of those who heard it. Since then this address has been reprinted in the *Bulletin of the Torrey Botanical Club*. With their permission and his we are reprinting it in this BULLETIN. A few of the allusions in it are so technical that they will not be understood by any one who is not himself something of a taxonomist. On the other hand, most of the address is deceptively simple; the tone at times approaches that of Lewis Carroll. It, like "Alice in Wonderland" and "Through the Looking-glass," has more real wisdom than is suspected by stupid readers.—E. A.

WHY I LIKE TAXONOMY — SEVEN MEDITATIONS

ROBERT E. WOODSON, JR.

I wonder how many of you saw the big full-page advertisement at the back of the comic section of the 'Phi Beta Kappa Key' one Sunday a few weeks ago? I didn't see it myself because, although you may not have guessed, I am not one of the brethren. But a friend of mine who is a Phi Bet noticed it and thought I might be interested. It read, and I quote (my friend, that is):

COME ONE COME ALL

WIN A BIG CASH PRIZE

[exclamation mark]

JOIN OUR COLOSSAL NATIONWIDE CONTEST

ALL YOU HAVE TO DO to win one of these BIG CASH PRIZES is to tell us in 500 words or less WHY YOU LIKE TAXONOMY. IT'S A CINCH because EVERYBODY LIKES TAXONOMY [exclamation mark]. Each and every contestant is entitled to write as many letters as he or she likes telling us why HE (or SHE) LIKES TAXONOMY, but no entries will be returned to the contestant and all will be considered the property of

KRISPY-KRUNCHY PLANT PRESSES, INC.
Cambridge 38, Mass.
[of all places]

HURRY HURRY HURRY

(Contest closes midnight, September 8, 1953)

It may safely be presumed, I presume, that at this gathering all of us present like taxonomy, as the advertisement says. And since at least enough of you, ladies and gentlemen, are my friends to have voted me into my present unenviable position, I am going to take you into my confidence and read you my answers before I rush them Special Delivery to beat the deadline. Don't look now, but I'm submitting seven entries: Seven—count 'em—seven!

I

I like taxonomy because—well—frankly, because I like flowers. I apparently don't have the passionate feeling that we see in some men and women. But I hope that I shall always remember how the blue columbine was spangled with spring raindrops in my grandmother's garden, and how the white plantain lilies looked and smelled in the corner of her stone chimney. Aside from their beauty of form and color, there is a healthful, peaceful detachment in flowers that (to be cautious about it) must be imparted much less freely by white mice and fruit flies. Perhaps I just don't understand, but I feel that one of the rewards of plant taxonomy is simply the flowers themselves.

Even herbarium specimens, some of them, make one catch his breath for their beauty. Because, as one of my graduate students once told me in a brief moment of revelation, when you know them well they aren't flat any more.

Nearly everyone loves flowers. Why, then, in spite of all the popular men's garden clubs and the like, do we sometimes wish that we were zoologists when another man asks us our business? Do you, as I, sometimes try to evade by saying that you are a biologist, hoping that the other will infer a lie? Why should we feel guilty about our association with plants? Are plants, by their nature, irrelevant and trivial?

I wonder how the flowers feel about it. Are they ashamed to call themselves plants because of their association with botanists—particularly plant taxonomists? I think that sometimes they might.

II

To be quite candid, Taxonomy was not my first love. Her name was Geography. But that was puppy love. You see, I was in third grade. I can't look back upon Grade School with any great pleasure except for the moments—yes, the hours—that I spent with Geography: those vast, beautifully colored maps, the inset sketches and photographs that could transform a thin, crooked line into a mysterious river, and tiny circles and dots into cities and towns so different from my own.

So Freud would understand why I like taxonomy because I like the sound of faraway places. I have not traveled very widely for this day and age; most of my students have seen more than I, thanks to the wars. But I am able to tell them still more, and not stir out of the herbarium.

The corner-stone of our herbarium at the Missouri Botanical Garden is the herbarium of Bernhardi, once professor at the University of Erfurt. When it arrived in St. Louis in 1858 it was found to contain amongst its treasures many specimens bearing only such notations as "Unalaschka" or "Sitka," and occasionally a name by Schlechtendal and Chamisso. A little detective work has proved that this collection, indeed, is that made by Chamisso in Alaska in 1816.

Adelbert von Chamisso was the foremost German lyric poet of his day. But he, also, loved flowers and the sound of faraway places. In 1815 he sailed with Captain Kotzebue from St. Petersburg aboard the tiny brig "Rurisevk," 27 hands aboard. Out the Neva and south around the Cape and up the China Coast and at last the fires of Alaska on the beam. Upon that foggy icy shore the poet found these flowers, and brought them back to Russia and to us.

Here is the type of *Asclepias arenaria*. It was preserved for us by Frederick Wislizenus, M.D., esteemed member of his profession in the bustling frontier town of St. Louis on the Mississippi. The place was the sand dunes south of Santa Fe, and the time was August, 1846. A band of Gringo scouts came upon him there and swore he was a mirage. One morning, good Dr. Wislizenus had set out from his office on Chestnut Street, alone in his sedate black buggy, and drove and drove on this incredible ride into the midst of the Mexican War, until we find him here.

These ugly thistles were bought with bombs and death beside Lake Tana, the Blue Nile's headwaters. Ethiopia, in 1937! Years afterward my friend sent them to me; my friend who gathered them, a gentleman and a gentle man.

Here are three mementos of a Yorkshire boy who ran away to sea. James Cook was his name: Captain Cook to *you*, sir. He sailed well and he fared well, and in 1768 was chosen master of H.M.S. "Endeavour" to sail 'round the world with Sir Joseph Banks and his botanist, Solander. In 1770 they sighted legendary Terra Australis and claimed it for His Brittanic Majesty, George III. There every plant was strange, and Botany Bay it still is. This blackened, brittle shrub then bloomed on that wild shore; it is here to speak of Cook, and Banks, and an empire upon which the sun would never set.

This sprig of *Nothofagus* once rustled in the dwarf forests of Tierra del Fuego, where it was plucked by the brothers Forster, lucky to be with Commander Cook on his second voyage of discovery, in 1773. No continents were Cook's this trip, but the magic of fruits and fresh green herbs.

And this common weed of many shores of many lands. In 1779 it was gathered by young David Nelson upon the sunny beach where tomorrow the great navigator would be struck down in ambush. (And ten years more, Nelson with Captain Bligh adrift in mid-Pacific.)

III

I like taxonomy because I like puzzles. Besides the problems peculiar to itself, biology compounds all the problems of all the other natural sciences,—plus mathematics. (Always mathematics!) Taxonomy is the apex of this staggering (and enticing) pyramid of question marks. Beneath it are the

stones of geography and geology and meteorology; and beneath them the stones of morphology and anatomy and cytology and genetics; and beneath them the stones of physiology and biochemistry. . . . And Goodness knows what else, for the ologies are increasing every day, and I, for one, cannot keep up with them. Doubtless within the crypt of the pyramid is enshrined the nucleus of the sacred atom. But the name of the pyramid is "Organic Evolution," and the symbolism of taxonomy is, or should be, the capstone.

In an herbarium we find so many discordant annotations upon the sheets, so many erasures, so many corrections. In the taxonomic library so much synonymy, so much criticism (magnanimous and otherwise). Once, in an idle moment, it struck me that one of the palaces of the New Jerusalem should be a celestial herbarium, each sheet with but one and truly authentic annotation. A duplicate set should be housed in Hades, but these, besides the *determinatio Divinitatis*, bearing full synonymy; yours and mine, our forebears', and of our seed from now till Doomsday. What could be more damning? But on the other hand, would Heaven be Heaven with all the puzzles solved? Purgatory may adapt us to it.

IV

We need species for much the same reason that we need inches and centimeters and all the rest, we tell our laymen (trying, I suspect, to strike a scientific sounding phrase and so impress them). I say that evolution is like music that we learn by ear and painfully transcribe. Ever-changing moods and tempo, sharps and flats and signatures; "thundering crescendos," "hushed diminuendos," "rests that speak more eloquent than sound." We, poor mortals, set ourselves to score the magic anthem (some tone-deaf or lacking rhythm).

Our taxa are the measures, phrases, movements—each with its own contribution to the whole. Is it strange that the same bar should be transcribed so differently by you and me?

Taxonomy is re-creative; it is intuitive; it is an art and not a craft. It is not describing; it is not identifying. Those are just pieces—and not all. Taxonomy is the whole. And that is why I like taxonomy, because I am an artisan at heart.

V

I like taxonomy because I like the taxonomists. We have a lot in common. Maybe they are a bit queer, but on the whole they (I mean we) are a grand crowd. Of course there is a sprinkling of Dr. Fells amongst us (the reason why, I cannot tell); and as for the really black sheep of the family

(and their friends), I can only kow-tow in the general direction of the late W. S. Gilbert and burst into anguished song:

As some day it may happen that a victim must be found,
I've got a little list—I've got a little list
Of taxonomy offenders who might well be underground,
And who never would be missed—who never would be missed!
There's the pestilential nuisances who write for separates—
Curators who take kleptotypes and split duplicates—
Authors of two-page "monographs," and nomenclature cranks—
Those who write for "county records," merely adding "Many thanks"—
Curators who on returned loans in stamped sequence insist—
They'd none of 'em be missed—they'd none of 'em be missed!
There's the boy scouts who are working on their merit badge, they say,
And the plant pathologist—I've got *him* on the list
And the folks who ask for lectures and never think to pay,
They never would be missed—they never would be missed!
There's the man who names each color form as soon as it is found,
And who changes varieties to subspecies or the other way around;
And the guy who loves to tell how many species bear his name,
But whose pencilled annotations are his clearest bid for fame;
And that ultra-modern genius, the biosystematist—
I don't think he'd be missed—not by *me* would he be missed!
And that legalistic schemer, who just now is rather rife,
The plant morphologist—I've got *him* on the list!
All know-it-alls, kibitzers, and clowns of public life—
They'd none of 'em be missed—they'd none of 'em be missed!
And ambitious physiologists of an *enterprising* kind,
Such as—Whatchamacallum, Yhudi, and likewise Nevermind,
And Wahoozis, and Whatsisname, and also Unowho—
The task of filling in the blanks I'd rather leave to *you*.
But it really doesn't matter whom you put upon the list,
For they'd none of 'em be missed, they'd none of 'em be missed!

VI

There are few things more exhilarating and comforting than telling something old to someone new. Particularly if that one is the younger. I like taxonomy because it has led me into teaching.

When I first began to teach, my classes were my younger brothers and sisters: each year fresh dozens of them; droves of them, so few without one trait I could admire. Fall was the most exciting time of year, with the new ones flocking in, and some old ones flatteringly "just looking in to see what's going on." I lectured them and evangelized those that I thought would make good evangelists; and they taught me, too. Agility and patience are required by students not quite decided if they wish to learn.

And the field trips! I wish I knew how many brides have told me: "Charlie says to ask how you make coffee." (Or Sam, Russ, Bob, Dick, or Henry.) Well—you fill a smudgey pot to not-quite-full from the spring at the foot of the hill. Pull out a few dead leaves and wrigglers. (While you're there, snatch a handful of cress.) In stumbling up the slope, be sure to lose about half to three-fifths of the water. And if the fire is burning brightly, now get the coffee half spilled in the pack. Count noses round the

fire—two spoons for each; when the water is hot, throw it in. Then have a jolly time and sing your songs till the pot bubbles over. And, Oh—at last do not forget to stir the fire; the ashes will settle the grounds.

I miss them, now that I have grown old enough and wise enough (the University considers) to be confined to Graduate School. I have disciples now, and must remember that I am a son of Greenman, who was a son of Engler, who was a son of Goeppert, who was a son of Beckmann, who was a son of Linnaeus.

VII

I was about to write "I like taxonomy because it is my livelihood," but it would be more true to say "I like my livelihood because it is taxonomy."

When students ask me "What opportunities are there in plant taxonomy?" I tell them: if you would rather study plants than anything, you will be successful; if there is anything you'd as lief be doing, you will be a failure. Adopt no other measure. I would say that happiness is success, and unhappiness is failure.

Look at me: I am as happy in my work, I think, as any man. But then look at my salary cheques; I would be poorly paid (working on holidays and Sundays as I do) if I were a plasterer, a carpenter, a steam fitter, a drill press or bulldozer operator. . . . How can I say I like taxonomy because it is my livelihood?

Look at my boyhood friends: stockbroker, bag manufacturer, tobacco processor, packinghouse executive, lawyer. . . . If they were paid as I, would they still call their lives successful? If I were paid as they, and they as I, would not there be more plant taxonomists? What would they do, then, with their Saturdays and Sundays and all their holidays, and their mornings before ten and their evenings after four which they use, now, to flee the work that pays them so well?

I cannot say that I am underpaid. What I am paid is paid to live with beauty, adventure, day dreams, fascinating puzzles, beautiful and profound designs, and companionship. These are other men's relaxations. The things they hope to do when they retire. I am paid for this; doing the things and talking about the things I would rather do and talk about, year by year—each with a fresh group of friends.

A beautiful specimen of the hybrid *Epiphyllum* "Vive Rouge" has been given to the Garden by Mrs. Eugene D. Nims, who raised it from a small cutting. It is now a magnificent plant with hundreds of pendent stems up to six feet long, and has been placed on display in the Fern-Cycad House.

MUNG BEANS AND THEIR SPROUTS

HAROLD J. KIDD

Have you never felt adventurous and tried a Chinese restaurant for some variety in your diet? If so, you may well have noted that while most of the culinary products were identifiable and quite common, a few of the vegetables were not familiar. One of these was probably the sprout of the mung bean, technically known as *Phaseolus aureus*. The sprouts of this bean are tender and juicy and have a delicate, pleasant flavor.

This legume has apparently been selected for the property of ready sprouting over a long period of years, probably for centuries. They are bush beans which withstand high temperatures and drouth fairly well. Farmers who grow mung beans state that they will germinate "on a heavy dew." The seeds of the varieties which are preferred for sprouting are approximately three-sixteenths of an inch long and may be shaped something like a nail keg or a cylinder. The seed-coat is a glossy green and quite handsome. Closely related types which are usually placed in the same species may be considerably larger, perhaps twice the size of the sprouting beans. If the shape is similar the seed-coat will probably be green and may be either rough and dull or smooth and glossy. Others are nearly globular and a light gold in color, similar in color and shape to many of the soybeans, but somewhat smaller.

The larger-seeded beans mentioned above are commonly grown in our Southwest and have been for some time. The Chinese with whom I have conversed have not been acquainted with two of them. It would be interesting to know how long these beans have been in North America, including the sprouting types. Most of the Chinese restaurants are dependent on our southwestern states (principally Oklahoma and Kansas) for the sprouting beans since our virtual cessation of trade with China. However, the Chinese beans are preferred, since American farmers are careless about cracked beans and pods and broken stems.

The sprouting of seeds for food is probably as old or older than agriculture. It is even conceivable that the practice is older than cookery, since one could make a hard, dry seed more palatable in this way. In the Orient many seeds are so treated, particularly in India and Burma. This custom is much less common in China, although the Chinese were probably the first to use mung beans.

We should mention that the sprouting of seeds is an ingenious trick for making good-quality protein from vegetable sources. Nutritionists inform us that plant proteins, even in sufficient quantities, are deficient for man, since they lack certain of the protein-building blocks called "amino acids."

However, actively growing tissues, whether plant or animal, will be surprisingly similar in their protein quality and amino-acid constituency. Certainly this type of "meat substitute" is much more attractive to your author than any yeast product he has yet tried.

DR. WOODSON'S MONOGRAPH ON ASCLEPIAS

An event of real scientific importance is the Garden's publication of Dr. Woodson's monograph on the milkweeds of North America. It comprises an entire number of our ANNALS and an over-sized one at that. It is basic research and therefore something seldom appreciated at its full value by the general public. The man in the street values scholarship when the end result brings something into his life which was not there before. He honors Edison for the invention of the electric light but neither knows nor cares for the long line of pioneers who brought our understanding of electricity to the point where Edison could use it effectively. Basic research is important because it is basic. It is just exactly that. It is a beginning; it leads to many other things and no scientist, no prophet, is wise enough to see all the various end-results to which a particular piece of basic research may lead.

To one who knows a little about such matters, Dr. Woodson's monograph has the intellectual beauty of any masterpiece. It has taken a long series of facts and made some ordered sense out of them. The genus Asclepias with which Dr. Woodson has been working has as complicated a flower as one can find in the entire vegetable kingdom. These blooms are so curiously contrived that even very few professional botanists can take one apart for you and explain what all the pieces are and how they function in the complicated business of getting the plant cross-fertilized and producing seed for another generation. Dr. Woodson has worked out all that not only for one milkweed but for the more than a hundred kinds which are included in his monograph.

If one milkweed bloom is complex, the genus as a whole baffles one's attempts at description. It seems to be one of those group of plants, like the orchids, in which Mother Nature has gone off on a wild evolutionary spree and produced type after type, all on more or less of the same fundamental ground pattern, yet bewildering in the way this pattern is varied from species to species. It is as though she had started with a rubber model which was inflated with air and then for each new milkweed had varied the spots at which the rubber was thick or medium or thin. Some little hicky which you can scarcely see in most of the species will balloon out in some of the others so as to dominate the whole bloom. This group of plants displays such bewildering variety that no previous botanist has ever succeeded in getting enough of the facts in his head so that he could mull them all over and produce a truly competent monograph.

Dr. Woodson has done this. He has shown where one species leaves off and another begins. There are maps showing the distribution of each species and black-and-white illustrations of a typical flower of each. He has worked with them until he has been able to set them out in a series of groups and super-groups of related species, according to their resemblances and differences. But Dr. Woodson is more than just another botanist, and his monograph shows it. He is a natural philosopher and a scholar. Every detail of the monograph has been meticulously taken care of. His use of Latin has a polish which is rare in these days; his discussions are effectively phrased and reveal scientific insight.

Taxonomic monographs of this sort, badly as they are needed for less basic work, are nowadays considered old-fashioned by some scientists. However, they have one advantage over more purely experimental studies; they are of permanent value. The very best experimental work is out of date a few years later. Further discoveries make it of purely historical interest. The problem is seen in a new light, and after a decade or so the paper which once was epoch-making is no longer consulted. This is not true of taxonomic monographs. If anything their value increases with age. A century from now the scholars who use it will salute Dr. Woodson's monograph as the work of a highly gifted man. They will appreciate his rare kind of imagination which could consider all the evolutionary complexities of this curious group of plants and make some kind of sense out of it. They will recognize him as one of those outstanding scholars who could not only distill a meaning out of complicated phenomena but who had the added ability to transmit it felicitously.

THE GARDEN IN JUNE settles down into summer. The big flower shows in the Floral Display House are replaced with a smaller exhibit of fancy-leaved caladiums; the water-lilies are set out in the pools but will not make much of a showing until late in July. The Linnaean Garden is beautiful throughout the month and the Rose Garden does well unless we have very hot and very dry weather. At the Arboretum (junction of routes 66 and 50) the big display of daffodils and spring wild flowers is over but the wild flowers on the glades are now at their very best. With the new trails provided by special gifts from the Garden Club of St. Louis, it is now possible for visitors to reach the glades quickly and comfortably. It is too bad these beautiful and unique Missouri wild flowers are not better known. There are Purple Cone-flowers, Wild Coreopsis and Missouri Primroses whose tiny plants bear big sulphur yellow blooms as big as salad plates. Glade Bluets come into flower this month and continue all summer. If there are occasional rains the glades make a dramatic display of bloom well into August.

HARRY COLLINS

One of the Garden's most helpful volunteer workers died suddenly of a heart attack on March 1. He was Mr. Harry Collins, a retired St. Louis business-man who for some years had maintained one of the finest private collections of bearded irises in this part of the country. Last year he was a member of the course for amateur plant breeders which is given each year at the Garden and this eventually led to his serving as a volunteer helper in the experimental greenhouse under Mr. Gillespie. It was a wonderful arrangement for every one concerned. Registration in the new courses for amateurs was heavier than had been expected, and, among other things, Mr. Collins saw to it that all the supplies were on hand for each class and helped the members to get flower-pots and propagating flats out to their cars. For him, it was an opportunity to continue working with plants during the winter months. His garden kept him pretty busy during the summer but left him relatively little to do during the winter and he was an active, able man. In the greenhouse there were plants and people to look after, people who were grateful for his help and plants which were visibly better for the extra care which they could not have had without him. He worked closely with Dr. Meyer and Mr. Gillespie who were young enough to have been his sons. It was pleasant to drop in during the middle of the morning when they all knocked off work for a few minutes and served coffee (brewed on the laboratory hot-plate) in battered old cups. The three of them obviously liked and respected one another and the work of the greenhouse was going forward happily and efficiently.

The Collins Fringe Tree being placed in its new site at the Garden

There were many fine things in Mr. Collins' garden, but the finest was a magnificent Fringe Tree, over 18 feet high, well rounded and of perfect proportions. After Mr. Collins death Mrs. Collins said that she would be happy to give the tree to the Garden in his memory. Fringe Trees, even small ones, are not easy things to move, but Mr. Trifon von Schrenk interested the Shield Shade Tree Specialists and they contributed their services. The tree was moved while it was still dormant, with a ball of four and one-half tons of earth. The final placing of the tree in the new site was quite spectacular and a good-sized crowd had gathered by the time it was lowered into the hole which had been carefully prepared for it. It was placed just to the east of Mr. Shaw's mausoleum in a spot where three paths converge. When in bloom it serves as the focal point for several informal vistas. Every care is being taken to make the tree happy in its new home. It has been well mulched and it will get thorough waterings throughout the season whenever the weather is at all dry. It blossomed nicely and as yet shows little or no evidence of having been moved so recently.

Friends of Mr. Collins and members of his family have made contributions (somewhat over three hundred dollars in all) to the Friends of the Garden fund in his memory. For some time we have been planning to hire an extra gardener to help Mr. Gillespie in the experimental greenhouse and to keep the grounds around Mr. Shaw's residence and the mausoleum in better condition. Room had been found in the budget to add such a man beginning the middle of June. With the money given in Mr. Collins' memory it was possible to start this work the last week in April.—Edgar Anderson.

History of the Rose. By Roy E. Shepherd. 264 pp. The Macmillan Company. New York, 1954. $4.75.

This is a remarkable book by a remarkable man. After an art-school training Mr. Shepherd went into the manufacture of ornamental metalwork. Taking up horticulture as a hobby, he has spent twenty-five years studying, collecting, growing, and breeding roses. He has become the world's authority on their history and is as responsible as any one person for the recent revival of interest in old-fashioned roses. This revival has been nation-wide; however, one has to visit only a few gardens in Greater Cleveland to realize what an even more profound effect Mr. Shepherd has had in his own community.

"History of the Rose" as a title is an understatement. The history is there along with much else: descriptions of wild species, discussions of the work of various hybridizers, an account of the vicissitudes of the great collection of roses brought together by the Empress Josephine. Much has been

written on the history of the rose, a good deal of it trash, a good deal of it hearsay. On all disputed points Mr. Shepherd reviews the evidence and gives his opinion and the reasons for it. He does not hesitate to call a spade a spade, though he has been more than charitable with professional botanists, many of whom in the last century have run away from the increasingly difficult job of putting accurate names on the world's cultivated plants.

The book has a good bibliography, a general index, an index of roses by both popular and scientific names, and a two-page diagram illustrating the rise and fall of popularity for the 24 major types of roses during the last three and a half centuries. There are 26 black-and-white illustrations of various roses, most of them half a page in size.

The appearance of books of this sort is a clear sign that the United States is coming of age horticulturally. On page after page of Mr. Shepherd's book there is evidence that though it is based upon an exhaustive study of the literature, it is no mere job with scissors and paste. The facts have been digested; the story has been put together critically in the light of the author's own extensive experience. This book is recommended reading for gardeners, for rose breeders, for botanists who think they know something about roses, for anyone with a love of plants and a lively curiosity.—E.A.

Roy E. Shepherd

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MISSOURI BOTANICAL GARDEN BULLETIN

Drawn by von Saltza in 1893

Henry Shaw, 1800-1889—A Pictorial Biography

Volume XLII **June, 1954** **Number 6**

COVER: Portrait of Henry Shaw, drawn after his death from various portraits.

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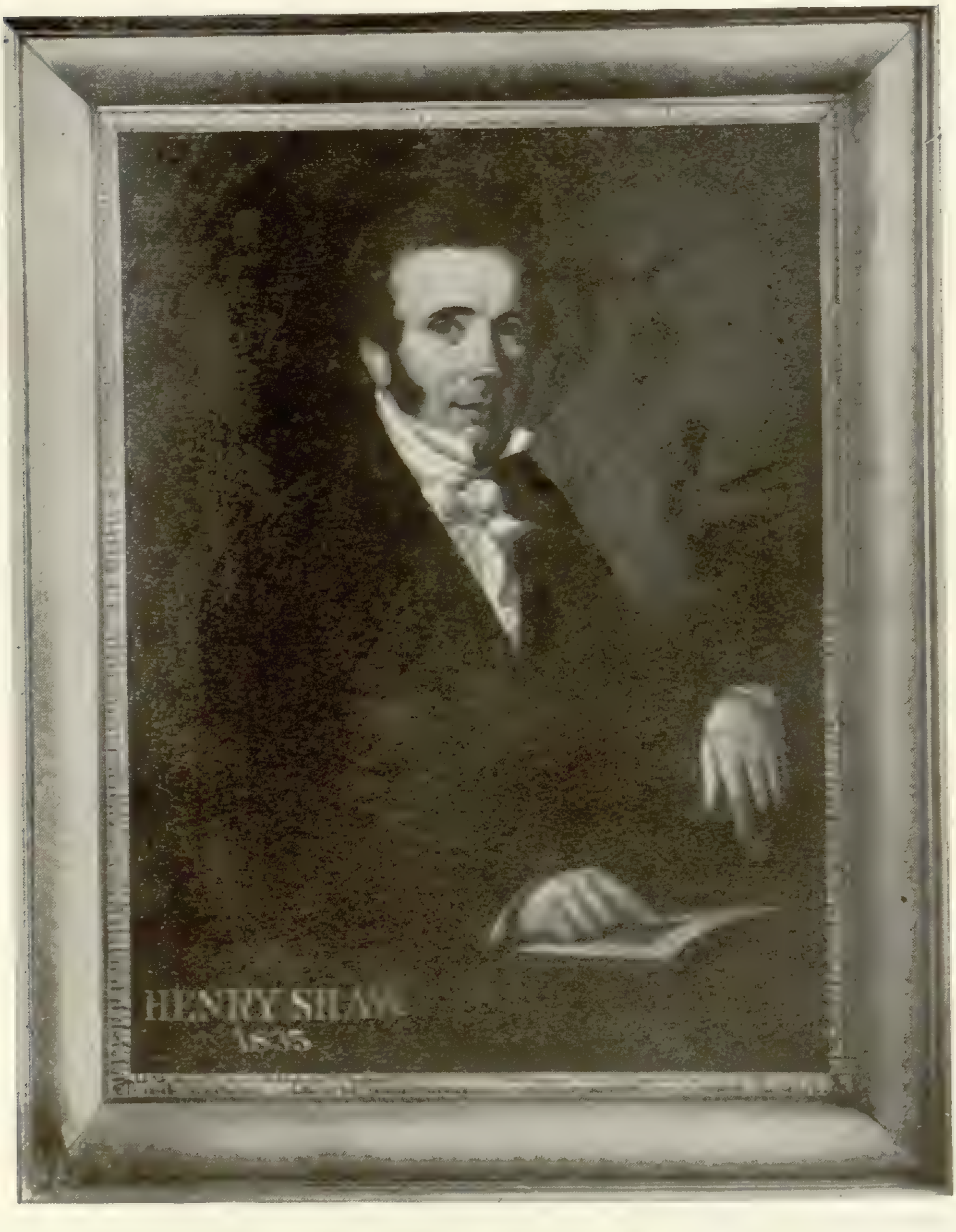
HENRY SHAW—A PICTORIAL BIOGRAPHY

THE MISSOURI BOTANICAL GARDEN was the official name chosen by Mr. Henry Shaw, the man who left this garden to the public, who planned it in detail, and developed it as a going concern during the last thirty years of a long life. Henry Shaw was an Englishman, born in Sheffield, who came to St. Louis as an enterprising young merchant in 1819, becoming at length the city's most distinguished citizen. His death, a full seventy years later, was officially observed by the City of St. Louis, and after an impressive public ceremony he was buried in the midst of the garden he had created.

During these seventy years he had made his fortune, had travelled widely and read even more widely (he read both French and Italian almost as easily as English). Though he retired from active business at forty years of age, he increased his income by shrewd investments so that he was able to build up Tower Grove Park, to provide a School of Botany for Washington University, and to equip his botanical garden with greenhouses, gardens, a library, an arboretum, and an herbarium.

He came to St. Louis just at the time when it was developing rapidly as an outfitting center for the West. He came with a little money to invest, a good training in mathematics and in languages, and from a family which on both the maternal and paternal sides was connected with the hardware business. He had studied French in school; he came to St. Louis by way of New Orleans; he had a natural liking for French ways and French people. He was quick to see the advantage of shipping goods up the Mississippi from New Orleans rather than by the long overland route from the eastern seaboard. With his knowledge of French and his contacts in New Orleans he was able to branch out and carry on such enterprises as buying sugar at a few cents a pound in Louisiana, moving it to St. Louis warehouses, and selling it advantageously when it became scarce in the Middle West. Before he was quite forty he had accumulated a fortune of a quarter of a million dollars, a large sum for those days. He then closed out his business and travelled widely, making three trips to Europe, one of them of several years' duration.

He returned to St. Louis for the last time late in 1851. His country home, "Tower Grove," had by then been completed and his city home was well under way. On his last trip he had formed the idea of leaving his estate for the public to enjoy, much as had been done with such



Henry Shaw at the age of thirty-five

This portrait shows the successful young St. Louis merchant a few years before he sold out his hardware business and travelled extensively in Europe. He went back to Europe three times, and on his longest trip spent much time in the Mediterranean area, visiting both Constantinople and Egypt. Many of the pictures and other works of art now on display in his old house date from this journey.

Courtesy Missouri Historical Society

Henry Shaw's city home at the corner of Seventh and Locust streets. From a water-color made in 1866 by J. H. McNamara. This is the house which was moved to the Garden after Mr. Shaw's death in accordance with his will. It now forms the northern portion of the Library and Administration Building at 2315 Tower Grove Avenue.

Courtesy Missouri Historical Society

Mme. Saugrain's house and garden. Mme. Saugrain's daughter, Mrs. von Phul, has told how Henry Shaw as a young man used to stop by their garden on his horseback rides out into the country.

English show places as Chatsworth. His close friend, Dr. George Engelmann, convinced him that it should be a real botanical garden with greenhouses, growing plants, a library, and an herbarium. Mr. Shaw took several years to make up his mind. He respected Dr. Engelmann but, like most St. Louisans, he thought of Engelmann as a successful physician and surgeon, never quite realizing that he was one of the greatest botanists of his day. When Sir Joseph Hooker, the Director of the Royal Botanic Gardens at Kew, came to America for a long trip to the West, Dr. Engelmann had him alerted to the situation in St. Louis. When Sir Joseph stopped off here as the house guest of Henry Shaw he was prepared to urge upon his host the importance of a first-class botanical garden in the developing Middle West. Mr. Shaw was convinced, and for the rest of his life, he labored to build up the best possible botanical garden for St. Louis.

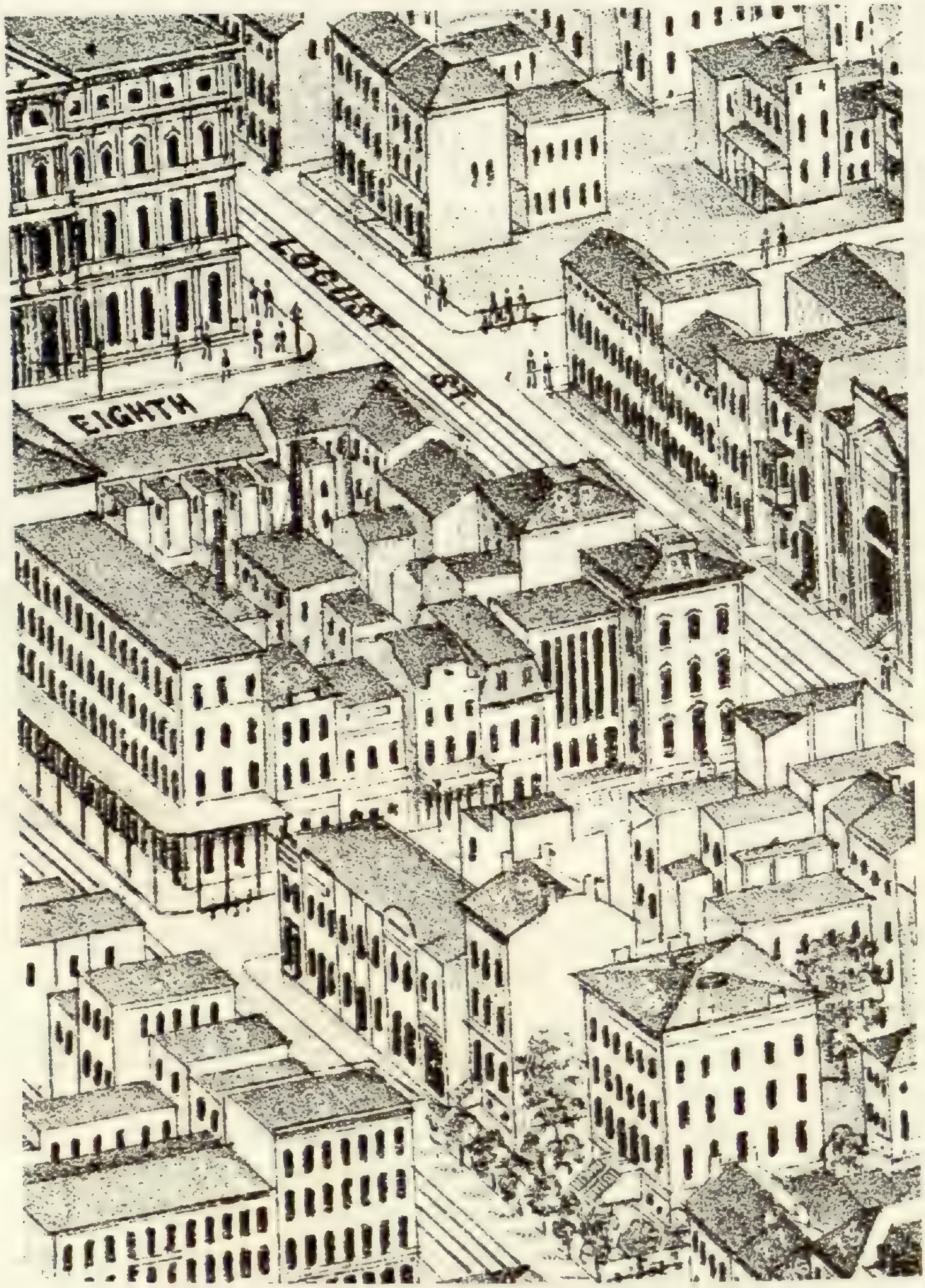
In 1859, Henry Shaw erected a brick and stone building as head-

VIEW OF THE CITY OF ST. LOUIS, MISSOURI.

Courtesy Missouri Historical Society

The St. Louis river front in 1854. From Gleason's *Pictorial Drawing-Room Companion.*

quarters for the library and herbarium. He sent Dr. Engelmann to Europe to buy botanical books and herbarium specimens, books and specimens which today are worth many times the price then paid for them. He started an arboretum, he built greenhouses, one of which, the Linnaean House, is still standing. He brought Mr. James Gurney from London as a superintendent and hired a curator for the library and herbarium. For thirty years he kept all the accounts, and made the plans and hired the workmen. If one examines the old account books at the Garden they go on for page after page, month upon month, and year upon year. The disbursements, the payrolls, the names of the gardeners, the days and hours they worked, are all there, set out carefully and legibly in Mr. Shaw's own handwriting. Just for the money value alone this was no small gift. To have hired others to work as business manager and as director would have cost even in those days around $10,000 a year. For thirty years this amounts to $300,000. Henry Shaw not only conceived the idea of a great botanical garden; he got one actually into operation and ran it himself for a third of a century.



Henry Shaw's city home (labelled 81) and its immediate neighborhood. Enlarged from a plate in Compton's *Pictorial St. Louis* published in 1876. The house stood on the corner of Seventh and Locust and was moved to the Garden after Shaw's death, according to the directions in his will. Had it not been moved, from the second-story drawing-room (now the Director's office) one would see the Ambassador Theater from the north windows and Famous-Barr from the east window.

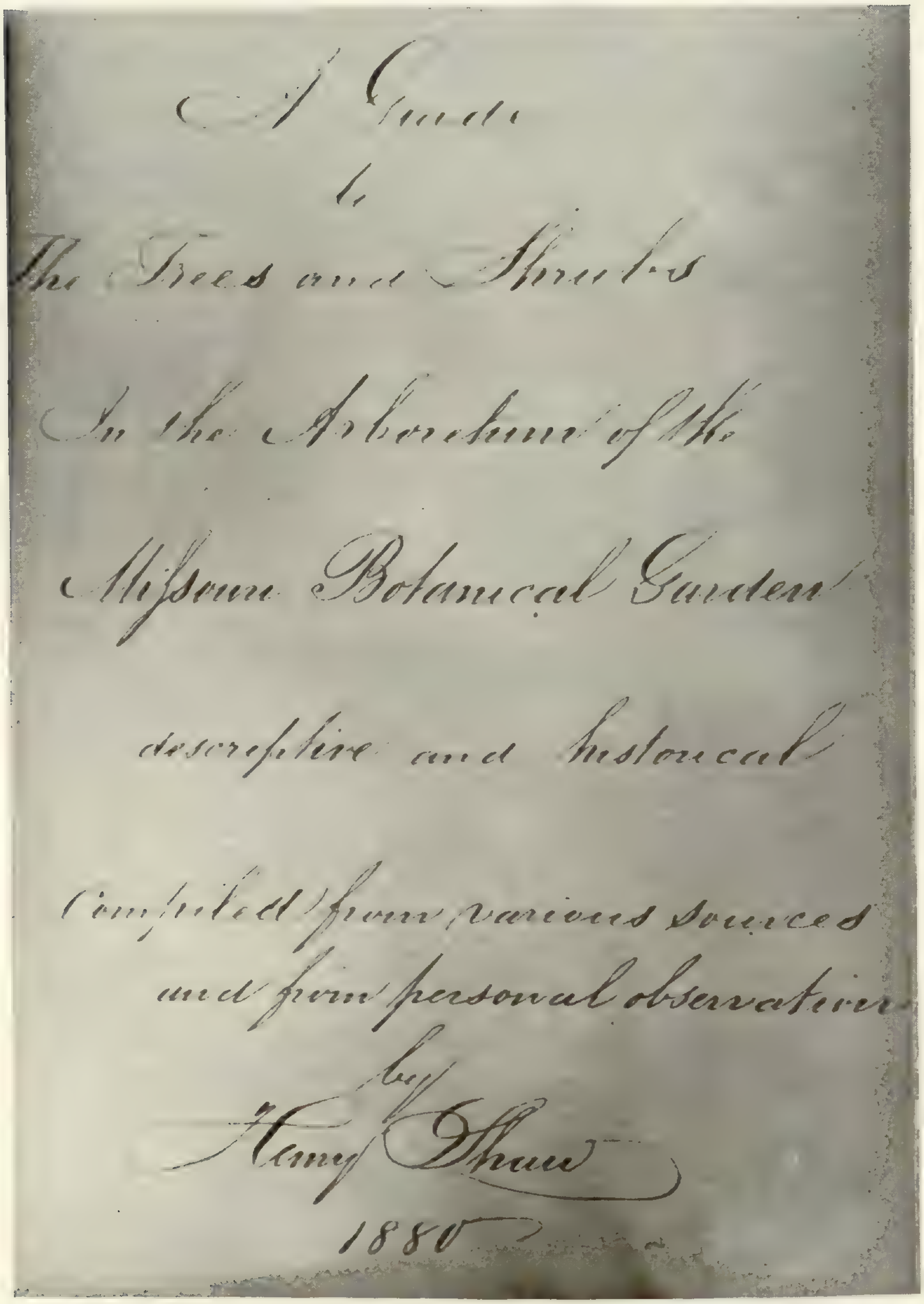
Henry Shaw's country home "Tower Grove" as illustrated during his lifetime in the St. Louis *Exporter and Importer.* The low-ceilinged east wing was largely given over to servants' quarters and was pulled down and completely rebuilt after his death. There was no central heating or running water in the building. To this day, though there is steam heat, there is still no running water in the original west wing. The original chandeliers have been successively adapted to gas and to electricity.

A portrait of Henry Shaw by Richard Miller.
Commissioned by the Board of Trustees after Shaw's death.

As the years passed he became more and more the city's leading citizen. He left the city and Tower Grove only at very rare intervals, dividing his time between his city home and his estate which was then well out in the country. (How far out may be realized from a remark of Dr. Engelmann's when Mr. Shaw pressed him to become the Garden's first Director. In refusing he gave one of his main reasons for not being more closely associated with the Garden the fact that he did not wish to "live so far away from St. Louis!") Distinguished visitors called on Mr. Shaw as a matter of course; he was a patron of the theater and knew visiting actors by name. Though not himself a musician he was interested in music. In Tower Grove Park, which he founded, he had a fine open-air bandstand erected. On Sunday afternoons he would drive out in his elegant victoria dressed in a high silk hat and a formal top-coat, to listen to the music which was being provided for the public. His birthdays became more and more times of city-wide celebration. His official biographer tells us how he was once publicly serenaded by Gilmore's band, then giving its annual series of concerts at the St. Louis Exposition.

"It was a lovely October day, with cloudless skies and mild yet invigorating air; the foliage just beginning to assume the many-colored livery of autumn, but still retaining the luxuriant growth of summer. Mr. Shaw was seated upon the lawn in front of the mansion, with a few friends about him, while at proper distance in front were grouped the sixty-five members of that famous orchestra. As the strains of soul-inspiring music saluted the ear of the venerable gentleman for whom they were primarily intended, his face lighted up with an expression of pleasure too deep for words, and he leaned forward in his chair as if unwilling to lose the faintest note of the divine harmony. The picture of which he was the central figure can never be forgotten by those who saw it; 'once seen, became a part of sight.' "

On the fourth of May, 1879, when Mr. Henry Shaw was a vigorous old gentleman just approaching 80, his friends and fellow-citizens made a formal celebration in honor of the sixtieth anniversary of his arrival in St. Louis. A local business journal, *The Exporter and Importer,* gave a full account of the occasion, explaining that Mr. Shaw was "the oldest living importer in the Mississippi Valley." To this fortunate circumstance we owe the preservation of Mr. Shaw's actual words in replying to the oration of the day. He begins his remarks, as a man of eighty



By reading and study Mr. Shaw made himself into a worthy proprietor of a botanical garden. This illustration shows a page from the original manuscript of one of several articles and small books which he wrote and published.

Henry Shaw showing Mrs. William Trelease and a friend around the Garden, after the former's husband (eventually the first Director of the Garden) had been brought to the city by Mr. Shaw as Engelmann Professor in the Henry Shaw School of Botany of Washington University.

might well begin, by pointing out that only a very few in the audience are old enough to remember what St. Louis was like sixty years ago. Therefore his "impressions and recollections of sixty years ago may not be unacceptable."

> "When I first visited these grounds, Tower Grove, I was in my nineteenth year. From the village of St. Louis I came through the bushes, by a narrow path winding among the sink holes or natural depressions of the commons, to the elevated ground now called Grand Avenue, where, open to the river, a beautiful prairie extending westward, uncultivated, without trees or fences, but covered with tall, luxuriant prairie grass, undulated by the gentle breezes of the spring, not a tuft of which can now be found. A patch of the wild strawberry (Fragraria Virginiae) could occasionally be seen, which has now entirely disappeared. I was informed afterwards by M. Landerville, an old resident, that these lands, being fertile and productive, were the first selected by the colonists of St. Louis for cultivation; and, according to the French-Canadian custom of allotting or conceding lands, had been given to heads of families settled at St. Louis for cultivation, of one by forty arpents, running west, and were called La Prairie de la Barriere a Desnoyer, from Louis Desnoyer, a concessioner, who kept the gate or barriere of the fence by which the commons of the village of St. Louis were surrounded.
>
> "For a distance of two miles from where the eastern gate of Tower Grove Park now stands, to Taylorwick Station, or rather to the pond then and now existing there, no trees were growing; all was prairie, the long grass of which was annually burnt; it had for many years been left uncultivated, and had reverted to the state of a natural prairie, as it had probably existed from all times. On the small water course, running to Rock Spring and then to the mill pond of Mons. August Chouteau, now covered by the streets and houses of the city, were growing the Nymphaea, or water lily. I also observed on a gently rising ground a clump of hazel bushes; thirty years later the hazel bushes had disappeared, and in their place had grown up a grove of oaks and sassafras laurels; in 1849 this house and tower were erected, and it became Tower Grove."

Mr. Shaw lived on for nearly another decade after this celebration. His official biographer, Thomas Dimmock, has described his last days as follows:

> "On the 24th of July, 1889, he received numerous visitors to

Henry Shaw

From a photograph taken four years before his death.

Since the time of the Norman Conquest, Englishmen of means have often been represented in effigy above their places of burial. Mr. Shaw followed this old custom, planning his tomb some years before his death, arranging the details with the architects and the sculptor, Baron von Miller.

Mr. Shaw's tomb as illustrated (somewhat inaccurately) in the *Exporter and Importer* a decade before his death. To any one accustomed to the family burial plots and tombs of great English estates Mr. Shaw's granite mausoleum and its grounds with their evergreen ivies and old cast-iron fences seem beautiful and appropriate. The snowdrops come up through the ivy and make patches of white in the late winter and early spring, to be followed by daffodils and wood-hyacinths. However, to some Americans, a mausoleum is necessarily a lugubrious and haunted spot. Perhaps this is just as well. It helps to reduce night-time vandalism; it gives the Garden a somewhat morbid attraction for certain visitors, who nonetheless carry away with them a helpful lesson of the way in which Mr. Shaw bettered himself and the city in which he lived.

congratulate him upon the commencement of his ninetieth year. He was weak physically, though able to meet them in the drawing-room at Tower Grove, and his mind was as clear as ever. This, however, was his last appearance in public. An attack of malaria upon an already enfeebled system speedily dissipated all hopes of recovery, and he died at 3:25 Sunday morning, August 25th. The death, peaceful and painless, occurred in his favorite room on the second floor of the old homestead; by the window of which he sat nearly every night for more than thirty years until the morning hours, absorbed in the reading which had been the delight of his life. This room was always plainly furnished. The windows look out upon the old garden which was the first botanical beginning at Tower Grove. On Saturday, August 31st, after such ceremonial as St. Louis never before bestowed upon any deceased citizen, Henry Shaw was laid to rest in the Mausoleum long prepared in the midst of the Garden he had created."

—E. A.

Brassocattleya "Henry Shaw" (Award of Merit, 1953)

Henry Shaw's name has been perpetuated by various plant breeders and botanists. He has had trees, shrubs, wild-flowers, and cacti named after him. There is a beautiful water-lily "Henry Shaw," and more recently this hybrid orchid, both of these, creations of Mr. George H. Pring, Superintendent of the Garden.

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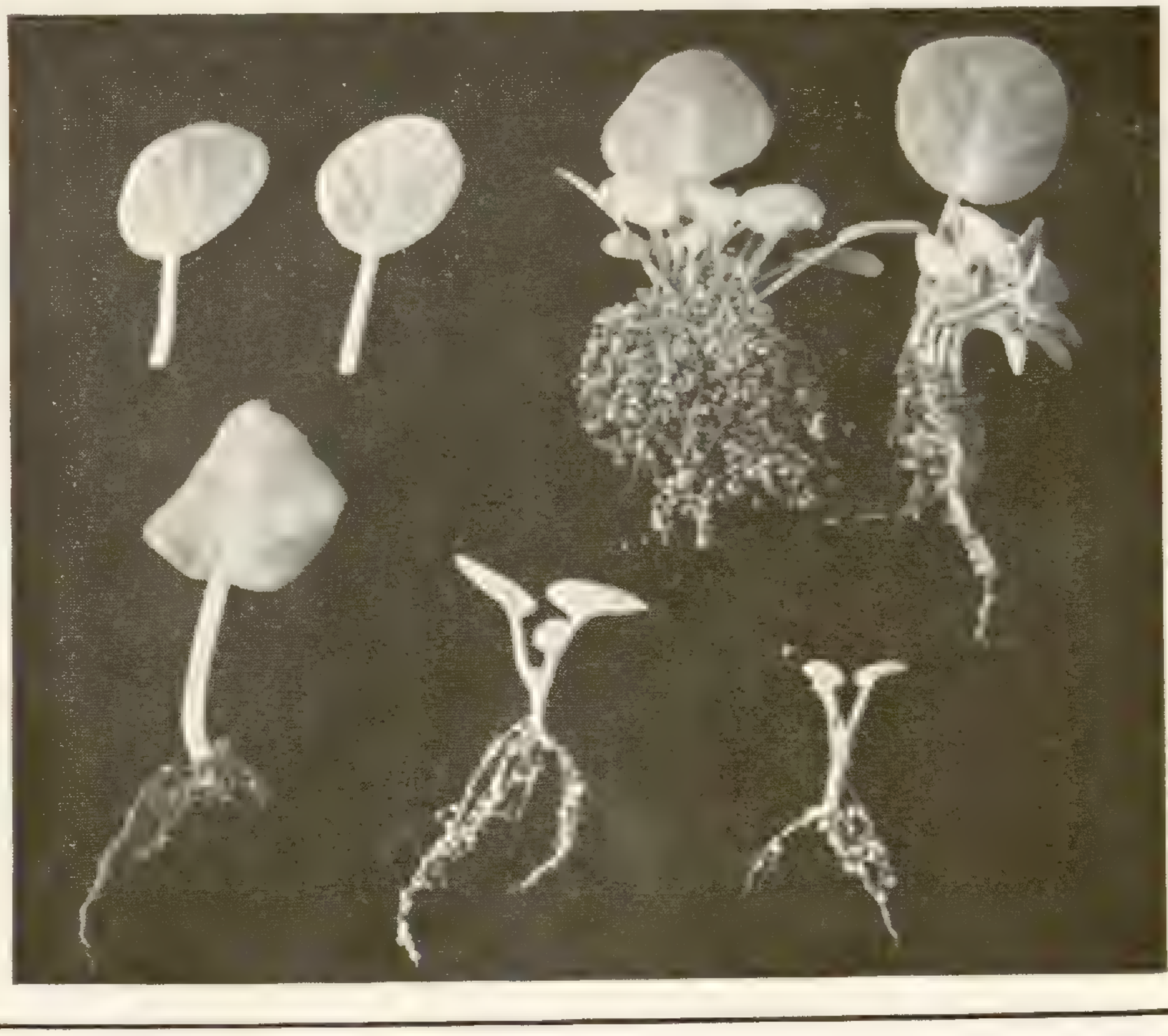

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COVER: Propagation of African Violets from leaves: upper left, two leaves prepared for rooting; upper right, two leaves after three months in vermiculite; lower left, leaf from which the plantlets at the right have been removed.

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Missouri Botanical Garden Bulletin

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THE IMPORTANCE OF THE AFRICAN VIOLET

In just a few years the African Violet has mushroomed from a botanical curiosity to a country-wide horticultural industry. Industry it really is and a very important one in terms of dollars and cents. The biggest operators use mass production methods and distribute the little potted plants by the tens of thousands to five-and-ten-cent stores and to retail florists, using a truck or a fleet of trucks and maintaining a more or less regular delivery schedule. The small operators grow their plants in the basement under fluorescent lights and sell to their neighbors or to passing motorists. As a national industry the total value of these operations is staggering. Estimates vary, but one scientist who has looked into the matter believes it is larger than the total value of all the fruit-tree business in the United States.

To the scientist, the African Violet presents a unique opportunity. It was domesticated within the last century and we can readily compare the wild and the cultivated plants and determine what has happened in the process of domestication. Wheat, corn, barley, oats, rice—these and virtually all our other important cultivated plants—were evolved under the guidance of man before the dawn of history. For none of them can we point to the wild ancestors. What happens when plants are domesticated is still a scientific puzzle. The African Violet is good experimental material for helping to solve such riddles.

—E. A.

NOTE.—This special number of the BULLETIN has been made possible through the interest and enthusiasm of the Council of African Violet Clubs of St. Louis and St. Louis County (an affiliate of the National African Violet Society of America). Under the leadership of Mrs. Fred Tretter they have planned and contributed the comprehensive series of articles which make up the bulk of this issue of the BULLETIN.

THE AFRICAN VIOLET SOCIETY OF AMERICA

VIRGINIA ZIMMERMAN
Webster Groves African Violet Society

The African Violet Society of America, a national organization, was organized November 8, 1946. In its nine years of existence it has grown to a membership of over 17,500. Miraculous though it may seem, this growth parallels the popularity of the most versatile of house plants, the African Violet. This membership, international in its scope, has been brought together by a common interest—the desire to learn more about and grow better African Violets. This may best be expressed by our national motto: "To stimulate a widespread interest in the propagation and culture of African Violet everywhere."

Through the *African Violet Magazine*, published quarterly by the Society, can be found the solution to many problems that confront the growers who wish to excel in producing outstanding specimen plants. In these magazines one has a storehouse of information invaluable to both the amateur and professional grower. Not only are there innumerable helpful articles by noted horticulturists, but also research reports and the registration report. All these articles plus those by noted amateur growers throughout the membership, in which problems and remedies are shared, are looked forward to eagerly by the members. A *Members' Handbook* is also published annually with a complete list of all members and affiliated chapters. Available to the affiliated chapters of the Society are color-slides, awards for local shows, and judging-school information.

The activities of the Society are directed by a group of officers elected annually and a Board of Directors who serve for a period of three years, giving untiringly of their time and effort. The Society has eleven regions, ten of which are in the United States, and one in the Dominion of Canada. Each of these regions is under the supervision of a Regional Councilor, a person talented and qualified, to whom other members in their region may turn for advice and counsel.

At the national conventions, which are held annually, the members gather in a spirit of friendliness and cordiality unsurpassed by other organizations. The St. Louis chapters were very fortunate in being host to the national convention of the African Violet Society of America in April of 1954. The talks given were on subjects vital to African Violet culture, by noted authorities. In conjunction with these meetings was held the National African Violet Show in which any member in the country could enter specimen plants in competition for the ribbons and awards. Only at this time can one see the wonderful plants exhibited by outstanding growers the country over and the introductory plants shown for the first time. This is indeed a sight to behold!

Affiliated and working closely with the African Violet Society of America are the eleven chapters in the St. Louis area under the guidance of the Council of St. Louis and St. Louis County. The organization of the first chapter in the St. Louis area in January of 1949 and the second chapter within the year was the nucleus from which the council was formed. On January of 1954 our last chapter applied for admittance into the council, thereby extending the popularity of the African Violet in our local community to eleven chapters.

The St. Louis and St. Louis County Council is directed by a group of officers which are elected annually. Also participating at the council meetings are the president and two representatives from each chapter. At these meetings, which are held twice a year, the members gather in a spirit of cooperation and friendliness. This spirit has been felt not only in the two local Violet shows staged by the St. Louis chapters but also in the tremendous success of the national convention.

The African Violet Society is a most vigorous organization desirous of bringing to all its members the knowledge most vital and imperative to the successful growing of specimen plants. The African Violet is one of the newest of house-plants, but in a short space of time it has captured the heart of all flower growers. Growing African Violets is indeed a source of great pleasure and handsomely rewards any effort put forth by the Violet-lover.

HOW TO TREAT AN AFRICAN VIOLET

MRS. G. W. ASCHEN, JR.
Amethyst African Violet Club

First, you've got to talk to 'em; my Mom says so—and she ought to know—she talks to all her flowers and has the prettiest and healthiest specimens in town. African Violets are alive too, just like us humans, and need lots of pampering and lov'n care.

Most growers lose sight of the fact they grow in damp cool places—so I always pile pretty rocks and pebbles around the tops of mine, and it doesn't hurt 'em—they love it. Activated soil conditioner sprinkled over the tops and worked in is also a boost to their morale, and as the song goes—

"You've gotta water 'em in the morning
Talk to 'em at night
Give 'em lots of lovin'
Treat 'em right,
For a PERFECT Violet is hard to find."

GROWING AFRICAN VIOLETS UNDER FLUORESCENT LIGHT

ADELE TRETTER
President, Greater St. Louis African Violet Society

My method for starting African Violet plants is to break off a firm, crisp leaf from a good, healthy plant. By breaking the leaf with a clean quick oblique pull, you will not leave a small nubbin to spoil the appearance of the plant. I always try to take a leaf from the second or third set of leaves. (Violet leaves always grow in sets of three.) The petiole is then cut about two inches in length. If the leaf is not firm, it will probably rot before it makes roots. The leaf is then hung in a small medicine bottle filled with Hyponex water (¼ teaspoon to 1 quart water). The bottle should be tall enough so that the stem will hang without touching the bottom. The bottles should be labelled so that you may be sure, one or two months later, what plant each came from.

When the leaf has developed roots, it is removed from the bottle and planted in vermiculite and sand. The leaves should be planted, if possible, before the little plantlets appear. After the leaves start to sprout they are watered every other week with Hyponex water. When the plant is about 1½–2 inches high, the mother leaf is cut away. Sometimes it rots off before then. The plants are left to grow until they are about 2–3 inches tall; then they are removed from this medium and divided. This is done by gently

Bi-color African Violet exhibited at the National African Violet Show, April 22-24, 1954.

pulling the little plants apart, being careful not to break the very fine hair roots. Another pan is prepared with vermiculite and a small amount of my planting soil. (I use damaged enamel refrigerator pans which can be purchased very reasonably; mine measure about 12 × 12 and 12 × 24 inches.) I use the small pans for planting leaves and the large one for the little plants. These would be much too large for starting just one or two leaves, but the same procedure is followed for few leaves using a small pan or a shallow flower-pot.

I make a small hole in the mixture with a pencil or small knife. The little plant is inserted, and the mixture is pressed close and tight enough to hold the plant firm. The plants are spaced about 3 or 4 inches apart. Again they are labelled. Small plastic markers are very nice for this as you can write on them with a water-proof pencil and they will not rot. The pans are watered once or twice a month with Hyponex plant food. When the plants are at blooming size, they can be lifted and planted in 3-inch pots. The mixture that clings to the roots should not be shaken off.

SOIL.—African Violets like a light, porous soil. My mixture varies, but I have found the following to be about right. Using a pound-coffee can for a measure, I take one measure soil, one measure leaf mold, one-quarter measure sand, one-quarter measure vermiculite, large handful dried egg shells and one handful charcoal (the charcoal they use for chickens); a small amount of super-phosphate can be added. I do not use any fertilizers in my mixture as I feed my plants about once or twice a month.

Bench of African Violets grown by Mrs. Tretter.

WATER.—My plants are always watered from the top with warm water. Plants should not be kept too wet as this would invite crown or root rot.

LIGHT.—African Violets like a lot of light, but not much sun. I found, when I had plants in my windows, that those in the north windows did best of all, and, they did not have any sun. The plants that do the best for me are grown under fluorescent light. I have between 500 and 800 plants grown under light. My lights are the 20- and 40-watt daylight tubes. There are six 40-watt tubes over one table 14 feet long by 3 feet wide. There are eight 20-watt tubes over another table 6 feet long and 27 inches wide. The lights are about 12 inches above the tops of the plants. They could be lower, but it is difficult to water the plants when the lights are hanging too low. The lights burn about fourteen hours a day. I, for one, would not give up fluorescent lights for growing African Violets. The plants grow more symmetrical; you do not have to worry about turning them in the windows; and they also have a much deeper shade of foliage and flowers.

A plant started in life with a good root system, not over-potted or overwatered, under a good strong light, all the suckers removed, and fed about once or twice a month, stands a good chance of becoming a show plant of beauty.

THE AFRICAN VIOLET

MRS. W. F. ANDERSON
Viking African Violet Society

The African Violet is really not a Violet at all, but a member of the Gesneria family, plants having hairy leaves, and is a cousin of the Gloxinia, Achimines, Episcia, and Columnea. However, the rest of the name is true; the plants are native to East Africa where they are found growing both in coastal and mountainous regions where the temperature never goes below 50° nor above 100° F., the average being between 70° and 80°. The air has a high moisture content, and the best plants flourish in shaded, wooded areas among moist rocks, in cracks and depressions containing much organic matter and rock particles. With this information about the native habitat of the plants, those of you who are interested in horticulture would have sufficient information to make these plants at home in their new environment in your own home.

The African Violet was discovered by Baron Walter von St. Paul, who sent plants and seeds to his father in Germany. The elder St. Paul gave some of them to Hermann Wendland, then Director of the Royal Botanical Gardens at Herrenhausen, near Hannover, who first described the plants botanically in 1893 and gave the plant the genus name *Saintpaulia*, in honor of the family, and the specific name, *ionantha*, from the Greek meaning "with flowers like a violet." Several other species have been discovered in Africa

since that time and are gradually finding their way into cultivation, though most of the present-day varieties are descended by mutation and cross-pollination from *S. ionantha,* the first species discovered.

African Violets were exhibited for the first time at the International Horticultural Exhibit in Ghent in 1893. The first African Violet Show in the United States was held in Atlanta, Georgia, in 1946. African Violets have gained great popularity, and feature articles about them appear in the garden and home magazines, and several books have been written about them. It is only in the past few years that scientific research has been completed so that we are beginning to get facts instead of old wives' tales to guide us in our culture. The national African Violet Society is sponsoring research at several universities, and reports of the studies appear in the Society's quarterly magazine. Several universities have issued bulletins which give the amateur a basic set of rules for culture. The Missouri Botanical Garden devoted its March 1952 BULLETIN to African Violets.

Good results with African Violets depend not upon one factor, but a combination of several factors. At best, we try to duplicate the native conditions in which the plant thrives. If you have been growing them successfully, continue doing it your way! If you are not getting desirable results, perhaps I can offer some suggestions which will help you. You will have to experiment a bit until you find the right set of conditions in your home which will bring both abundant bloom and good foliage.

One of the main requirements for beautiful African Violet plants is good light. Since they flourish in shaded wooded areas in their native habitat, it is obvious that this is no plant to grow in a flood of sunshine; but lacking sufficient light the foliage grows rank and the plants do not bloom well. Many growers prefer an east or north window, but African Violets can grow in any window provided they are protected from the direct sunlight by a thin screen to give filtered light. We can make a simple check to find if the light intensity is right. Hold the hand about six inches above the foliage. If a shadow is faintly visible, the light is right; if there is a distinct shadow, some shade should be provided. If there is no shadow, the light is not strong enough to develop blooms. Violets grow beautifully under fluorescent light without any daylight.

One of the nicest things about our adopted East African natives is their tolerance of our usual household heat. Too often house plants, for bloom and survival, require temperatures of 60° or less, an uncomfortable state for humans. The ideal temperature for Violets is between 70° and 80°. Minimum temperature for good growth is 65°. Less than 60° checks both growth and flowering. We should check plants at the window-sill to see that the temperature there does not drop below 65° and that the leaves do not

actually touch the pane of glass. A circulation of fresh air around the plants is essential, but they should not be subjected to cold drafts.

In the native habitat, the African Violet grows where there is a high moisture content in the air. They prefer a humidity of 50–70 per cent. This is one condition which we cannot meet in our home. We can, however, maintain a high humidity in the immediate vicinity of the plants by setting the pots on trays of damp sand or gravel, by spraying the plants with a fine mist spray on dry days, or by growing them in the kitchen or the bathroom where the steam from cooking or the shower fills the air. When the air is too dry, buds fail to open.

In their native habitat, African Violets are found growing among moist rocks in cracks and depressions. This gives us the clue to their water requirements. The plants like to be kept moist but not wet. When we have learned the difference between moist and wet soil we have progressed a long way toward successful African Violet culture. The roots are very fine and usually shallow-growing. The plant dies if allowed to wilt too often because the fine roots dry up, and, on the other extreme, the roots rot if waterlogged. They need air in the soil for good health. The basic rules for watering are easy to follow. Soak the plant thoroughly in warm water (rain water preferred) when you water it; remove any excess, and don't water again until the soil surface feels dry, but don't wait until the plant wilts.

Going back to the native habitat, we know that African Violets flourish in cracks and depressions containing much organic matter and rock particles. This tells us that they are shallow-rooted and require a soil that is light, crumbly and porous, which drains well. Our notive soil is too fine and heavy for Violets. They need only a moderately fertile soil, but it must be open and well-aerated. By adding about two parts of humus and one part of sharp sand to two parts of good loam, we get a basic potting soil which is satisfactory. A slightly acid soil (pH 6.5) is best. By the addition of humus in the form of oak-leaf mold we get a slightly acid potting soil. There are as many recipes for potting soil as there are growers, and some fertilizer may be added to the soil. However, too much fertilizer will stunt the plant, and most growers prefer to use a light soil and feed as the Violets need it. During and after a period of heavy blooming, some fertilizer will be beneficial. Apply from the top in weak doses about once a month. Do not apply to a dry plant, and don't spill the fertilizer on the leaves. Heavy feeding gives good foliage but little bloom. Small plants do not require feeding until they reach blooming stage.

African Violets are relatively free from insects and diseases. Cyclamen mite is one of the worst pests and can be controlled by sodium selenate. Aphids, mealy bug, and thrips sometimes attack the plants and can be controlled by nicotine sulphate or DDT. Nematodes are soil-borne and attack

the roots. There is no safe home control to destroy nematodes after they have attacked a plant, but sterilizing the soil will prevent infection of clean plants. The best pest control is prevention. Isolate all new plants before introducing them to your collection. Keep Cyclamen plants, Gladiolus, and Coleus away from the Violets, as they are our most likely source of Cyclamen mite, thrip, and mealy bug in the home. Crown rot, which is responsible for the death of a great many Violets, should not be considered a disease, but rather the result of unfavorable conditions—too rich soil, water-logged plants, or water standing in the crown.

Montague Free, in his book "All About African Violets," says:

> ". . . it is not enough to provide optimum conditions in one respect alone. If you remove one leg from a three-legged stool it does not make a satisfactory seat; similarly when growing Saintpaulias if one of the factors necessary for success is lacking—soil, fertilizer, temperature, correct watering, light, humidity, or freedom from pests—the cultural structure has an uneasy balance and is likely to topple over."

If you want to grow beautiful African Violets, first choose a variety that has the habit of growth and the color of blossoms and the type of foliage that *you* like. Choose one that will be attractive on your window-sill even when it is out of bloom. Don't waste your time trying to produce a specimen plant from a poor variety. The color of Violet blossoms ranges from pure white through shades of pink, orchid, and lavender, to deep purple. There is no rose-red nor yellow Violet yet. Varieties vary in shape of blossoms, as well as the number of blossoms produced on a stem, and in size of the blossom. There are double varieties to duplicate nearly every color of the singles. Foliage varies in color from light green to a deep bronze-green, with some varieties having variegated foliage. Varieties vary greatly in growth habits. Some have long petioles even when well grown; some are miniatures; some have a flat, even habit of growth; some are upright growers; some are droopy. There is one group of Violets designated as "girl type." This has nothing to do with the sex of the plant, but is a descriptive term commonly in use to designate foliage with scalloped edges with a white or pale green splotch on the leaf blade where it joins the petiole. The surface appearance of the leaf varies with the variety. Some are quite hairy, while some are quite smooth, almost waxy in appearance. The shape of the leaf varies from round, heart-shaped, to narrow and pointed. The surface may be quilted, heavily veined, spooned, or sometimes actually bent or wavy. Varieties that have poor habits of growth are still propagated. Be choosy when you grow a plant! Grow the varieties that are really beautiful for both foliage and blossoms.

Violets are easily propagated either by division, by a leaf-cutting, or from seed. This may be one of the reasons for the rapid increase in popularity. It is very simple to start a new plant from a leaf. Do this with discretion. Don't start every leaf that you break off accidentally. Be choosy. Propagate only the varieties that are worth while.

WHITE ATTRACTION

PURPLE KNIGHT—deep violet

MENTOR BOY—violet-blue

PURPLE PRINCE—deep purple

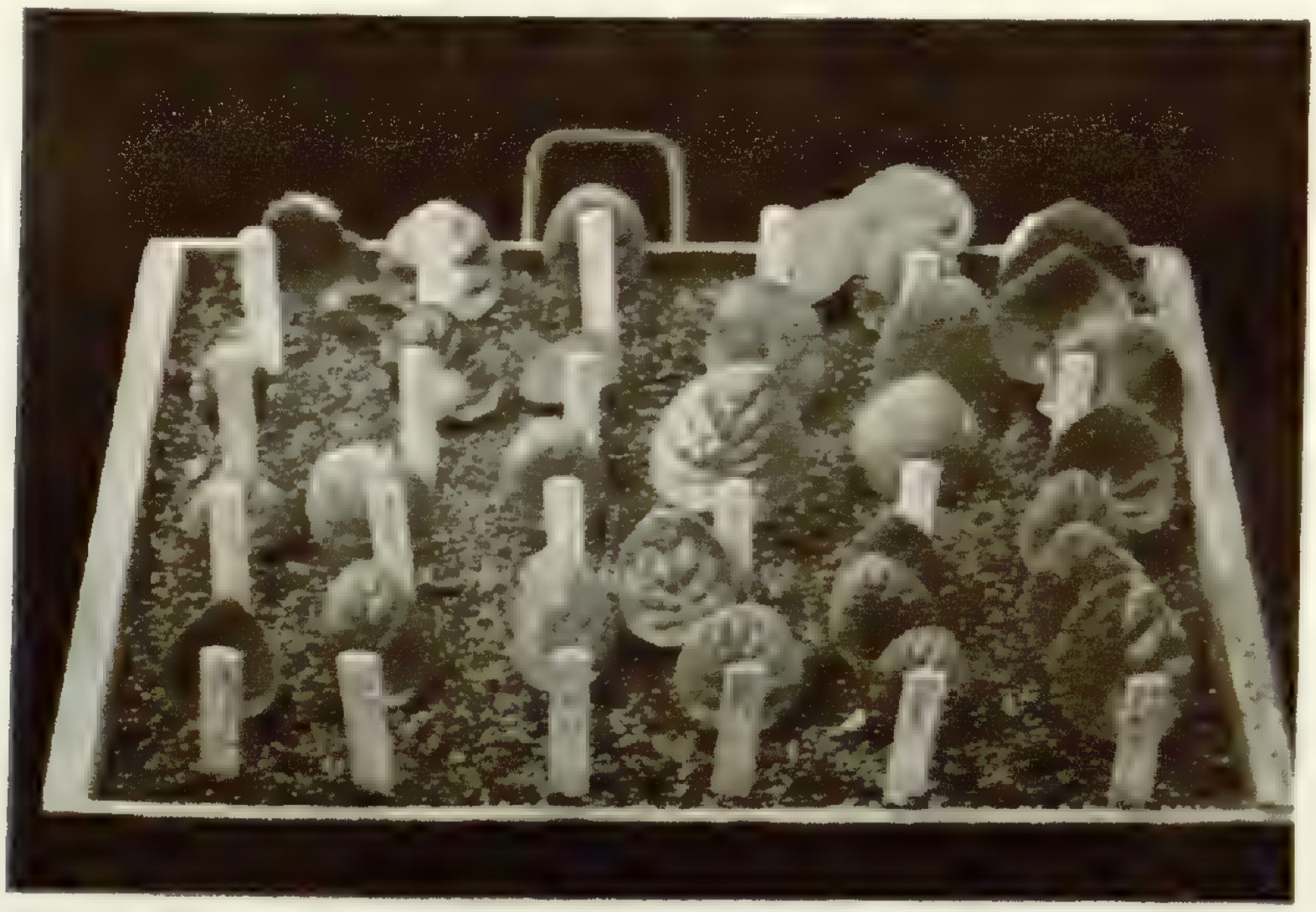
LAVENDER BEAUTY—large-flowered

WHITE HYBRID

SOME AFRICAN VIOLET VARIETIES

If you are interested in starting a plant from a leaf, first choose a leaf that has the most desirable shape. Choose a mature, healthy, well-formed leaf, which is neither the oldest nor the youngest on the plant. Try to improve your plants by careful propagation. Break the leaf off the plant so there is no stub left to rot. Then cut off the petiole so there is 1–1½ inches left below the leaf blade. This leaf may be rooted in water, damp sand, vermiculite, or in a loose potting soil which is not too rich. A very commonly used propagating mixture is equal parts of peat moss, sand, and vermiculite.

My favorite method for starting a leaf is to prepare a very small pot just as I would for regular potting. For me this means protecting the pot rim with a narrow band of foil on both sides, covering the drainage hole with one large piece of broken pot, and then covering that with a shallow layer of sphagnum moss before adding damp potting soil. Next, scoop out the center to make a core. Inset the leaf, holding it about ½ inch below the soil level and fill around the petiole with vermiculite. Support the leaf to keep it from falling over, by leaning it against a small stick covered with a fat pad of cotton. Place the pot in a saucer of water until the top soil is moist, drain off any excess, then cover leaf and pot with an inverted glass. As long as the leaf remains firm and healthy, all that is required is time until small plants develop. The pot will need very little watering. If heavy condensation appears on the glass, I lift it off to let the pot dry out a little. If there is no condensation, I know the pot needs watering. The pot is kept in a light, warm but not sunny spot. When the little plants are about 1–1½ inches tall it is time to separate them. The mother leaf is left on as long as it remains healthy, until it begins to shade the young plants, or until time for separate potting. Small plants should be grown in small pots until there



African Violet leaves being rooted in vermiculite.

is a mass of fine white roots around the earth ball or until the roots start to come out of the drainage hole. Shift them to the next larger size pot; don't try to make a short cut at this time and put them in a large pot before they are ready for it. Plants can be grown to blooming size in 2½ to 3-inch pots, and few Violets require larger than a 4-inch pot. Repot, adding fresh soil about once a year. It is better to grow young plants for replacements than to try to keep a Violet growing well for several years.

* * * *

Here are a few do's and don'ts for Violets:

Don't bury the leaf stem more than one-half inch. The young plants develop at the end of the petiole. The deeper you bury the stem, the farther the young plant has to go to reach the light.

Support the leaf blade with a padded stick until it develops roots which will hold it upright; otherwise, if it topples over it will break off the small roots which have been forming.

Do keep the soil moist but not wet, and cover the leaf to keep it in a humid atmosphere so it won't dry out until it gets established. Improvise a temporary greenhouse or Wardian case, a refrigerator dish with a cover, the inverted glass, a glass lid over a fish bowl, a plastic bowl cover for a lid, or tie a cellophane or pliofilm bag over the pot.

Don't over-pot your leaves or your Violet plants. It is easy to over-water in too large a pot.

Do tamp the soil lightly so there are no air pockets when potting, but don't break off the roots by tamping hard, and don't make the soil a hard, tight, compact ball. When you have finished, the earth should remain light and crumbly in the pot.

Here are a few suggestions for taking care of mature plants to produce specimen plants:

Keep all dead and rotting leaves, blossoms and blossom stems removed.

Remove all suckers when small so they will not spoil the shape of the plant.

Grow only one plant in a pot. Multiple crown plants are not specimen plants.

Turn the plant about a quarter turn whenever it starts to lean to the light, to keep the foliage growing even and symmetrical.

Keep the foliage free from dust by brushing gently with a very soft brush or by washing under a gentle spray of tepid water.

If you have washed your plant or spilled water on the leaves, be sure it has a chance to dry before setting back in the light to avoid water spots.

Train the leaves in a symmetrical pattern and train replacements to fill the gap when a leaf is removed or accidentally broken.

With African Violets excesses are to be avoided. Over-potting, over-watering, over-feeding, and too much shade will produce good foliage but no flowers. The Violet's demands are few but constant. Such a handsome flowering plant is worth a little trouble. Even when out of bloom, if well grown, the African Violet can be an asset to your window garden for its foliage alone. If you will try to duplicate its native habitat you should have beautiful blooming plants.

PESTS AND DISEASES

JEANETTE RIEFLING
President, Evening Sunset African Violet Club

Like most amateur growers of African Violets, I have lost my share of plants. Luckily, I have had no trouble with pests, but most likely my losses were due to my own carelessness or irregularity in care of plants. My plants grow on north window-sills and get the regular or irregular care that a busy working-person can give them.

Among the pests that worry African Violets are: mites (Cyclamen and broad mites), mealy bugs, nematodes, black flies, springtails, thrips, and aphids. One of the best ways to avoid any pest or disease is to isolate any new plants or any apparently sickly plant so healthy plants are not affected. If a plant persists in being wilted, dwarfed, or sickly it is best to discard it.

Mites may not get too firm a hold on a healthy plant, but they are a serious problem and need careful attention. The Cyclamen mite, very small, is the harder to fight. It attacks young plants and young leaves in the crown, causing a dwarfed misshapen leaf, usually with hard, upturned leaf edges and more than usual hairiness. Broad mites are more likely to attack the under-sides of leaves, causing them to curl down. Mites are most troublesome in hot weather. Since the treatment, according to authorities, is effected by rather dangerous poisons, an amateur had better discard plants with mites.

Mealy bugs usually affect the place where a leaf joins the main stalk. Any one who raises plants of any kind is familiar with this white or gray cottony-looking pest. There are commercial remedies for mealy bugs, but they may be exterminated by touching affected spots with cotton dipped in rubbing alcohol. Since the alcohol has a burning and dehydrating effect, it is well to wash off the alcohol, or at least dilute it, soon after application.

Nematodes are the most deadly of all the pests. Commercial growers use commercial preparations to exterminate them. The amateur had best discard the plants affected. After hearing a talk on nematodes the amateur is sure that not only his Violets, but he himself has nematodes. In reality, from knowledge and inquiry, relatively few amateur growers ever have them.

Varieties of nematodes range from microscopic to nearly one-quarter inch long. The longer the variety, the more likely they are to be harmless. Knotted petioles (leaf stems), knots, galls, or swelling of roots and root decay are, in general, symptoms of nematodes. An accurate diagnosis requires a nematologist. As is usual with any diseased plant, discard the plant with nematodes.

Aphids, as most of you know, are insects that suck the sap from plants. In your garden it is easy to detect aphids by the presence of ants. In the house you will have to see the insect itself. As a remedy, use usual methods for aphids.

Thrips, springtails, and black flies are named among the lesser pests. I have had no springtails, and hope I do not, although they are not harmful. They sound very interesting to see, from the way they spring about.

The greatest difficulties you will meet in raising the African Violet are crown rot and petiole rot. In crown rot the whole crown turns brown and the leaves get jelly-like. In most cases this is due to too much water. I find too little water acts the same way. The best thing to do in either case is to watch each plant carefully and note the amount of water it uses. Crown rot usually is caused by allowing water to settle down into the crown. This does not mean one should not water from the top, but that in watering from the top water should not be allowed to settle in the crown. When watering from the bottom, an incrustation forms on the top of the soil and on the collar of the pot. It is well to keep this washed off. If you are having crown rot, trim off all affected leaves. Often you can go on from here; again you might

Crown rot on Saintpaulia plants. Plant on the left is completely rotted off; that on the right is badly affected but probably could be saved.

have to repot. The petiole rot is usually caused by the leaf stem resting on the top of the pot where dampness and incrustation causes it to rot and collapse. If the tops of pots are well covered with metal foil, most of your trouble will be eliminated. Glazed pots are a good protection to the petiole, but with them it is harder to control the proper amount of water needed.

On the whole, prevention, not cure, is the better method with African Violets. They are a much hardier plant than most people suppose, and they really reward their careless owners more than is deserved. Give regular and consistent care; study the amount of water that gives best results; water from top or bottom with warm water (slightly above room temperature); fertilize with some such product as Hyponex as directed on package (that is, if you have not used some fertilizer when potting the plant); do not plant African Violets too deep; keep window-sills or shelves where you have them free from dust; you may occasionally wash the plants at the sink by gently spraying but be sure you do not shock them with too great a change in temperature; do not allow sun to shine on the leaves or they will be burned. Do these things and you may enjoy healthy flowering plants.

I find that containers with an inch or more of sand are best to set the potted plant in. Then water from the top and allow excess water to lose itself in the sand. If the sand is kept moist, I find that, even through hot weather, my plants have healthier and greener leaves and develop blossoms.

For those who may wish to do some reading on their own, the following bibliography is given:

African Violet, a quarterly publication of the National African Violet Society. Three dollars and fifty cents a year gives national membership and the magazine. Or, if you are a member of a local violet club, your $3.50 gives you membership in the local club in addition to the above.

Readers' Guide to Periodical Literature gives under listing, "African Violet," magazine articles on the African Violet.

African Violets, by Helen Van Pelt Wilson. $2.95 at local stores. Contains 250 pages of extremely readable material on African Violets. The author knows her violets, knows how to tell it and, above all, gives freely of her experience and methods.

All About African Violets, by Montague Free. $3.50 at local stores. This book of 250 pages covers about the same material as the above but in a different way. While Mrs. Wilson writes of her own Violets, and you realize it, she writes in a more general way. In Mr. Free's book you are not only reading about his Violets, but you get refreshing sidelights on the man and experience some of your own experiences with him. Both books should be on your coffee-table or other handy table where friends who drop in might enjoy themselves and at the same time get some knowledge of this lovely plant, the African Violet.

THE THERAPEUTIC VALUE OF AFRICAN VIOLETS

HOPE HOLLOWAY ZIMMERMAN
Ionantha Society

The thought entered my mind as I was tying blue ribbon on an especially beautiful plant at the recent National Show that if the judging were based on the amount of good the plant had accomplished for its owner how different the display would have appeared. In all probability the plants which would have won the most blue ribbons were still at home enjoying life on their own favorite window-sill or in a basement. In fact, they might well have had no qualifying points at all. They could easily be just one straggly little leaf with only faint indications of a root system. For that is really all it takes to absorb the owner completely and make her (or him) forget the frustrations of life.

How many times have I retreated to my Violets when the pressure seemed too great to bear—when my teen-age daughters' theme song, "We must have more clothes," and my husband's, "We must cut down on the bills" seemed like a continuous beating of drums in my ears; when the girls' discussions develop into an argument and then literally become a fight, and my aged parents who live with us offer their advice on rearing children; when far more serious world problems come shouting over the radio and staring from the headlines to envelop one in a state of depression! Then again my Violets come to the rescue and if I can discover a bud on Edith Cavelle (would that I could!) then I have new strength and courage to enter the fray more calmly and objectively.

But my own needs and fulfillments are probably infinitesimal in comparison to the accomplishments of violets in other homes. There were many such stories at the recent convention. One that I cannot forget concerned a woman who was saved from a nervous breakdown when she became interested in raising African Violets.

There is something about this plant that has the ability or power to completely absorb attention during the time spent with it. And it also has the power to make its owner appear slightly foolish to non-converts. When, for example, one shovels snow and carries it into the house, neighbors are apt to shake their heads. They cannot understand, of course, how those plants are thirsting for nature's own liquid without the benefit of man-made chemicals. And when friends are telephoned and asked to please not throw away the water from the refrigerator after defrosting, they too are apt to wonder if a psychiatrist might be needed. They do not realize that it is just such actions that are keeping the psychiatrist away from the door.

Husbands are not at all likely to understand or appreciate the vernacular that absorbs their wives vocabulary. I will omit my husband's retort when I proudly announced that Mrs. Pink Cheer had just had twins.

CROSS POLLINATION FOR PROPAGATION FROM SEED

GRACE B. WAYMAN
President, Viking Society

Starting African Violets from seed is one of the most interesting undertakings you can experience in the growing of house-plants. The process is still more interesting if you start from scratch and obtain the seeds from your own plants.

I have read that African Violets occasionally do set seeds in the wild, but not very freely. On close-up inspection of a flower, you will note that the styles point to the right or left, well away from the pollen-bearing anthers. This probably is to prevent self-pollination. The African Violet not only avoids self-pollination, but I have read that it is difficult to secure cross-pollination. However, I found it very simple. The style is the stalk of the pistil, and at its base is the ovary containing ovules, which, when fertilized, develop into seeds. At its tip is the stigma, a tiny knot on which the pollen grains germinate to effect fertilization. The pollen is produced in two 2-lobed anthers placed back to back, and there it stays unless the anthers are separated. We can only imagine how pollination can be achieved in the wild, but the following method is how I achieved it in my home.

Apply dark nail-polish to both thumb-nails. Place left thumb-nail beneath the anthers and crush them down on it with the thumb-nail of the other hand. This results in a deposit of pollen on the thumb-nail which is, in turn, gently smeared on the stigma of the flower selected to be a female parent.

In my experience I have not as yet had a failure. Every flower I pollinated had a seed-pod. Some of the seed-pods, even though they all had been pollinated at the same time, were very small, while others were quite large. I cannot say if this was caused by the amount of pollen applied, or whether some varieties set larger seed-pods than others. It could be caused by using the pollen of a flower too old or too young, or by selecting as the female parent a flower too old or too young. I found the best results were obtained when mature, but not fading, flowers were used, both to provide pollen and to receive it.

After a week or ten days, if fertilization has been effected, the ovaries will begin to swell, and in six weeks will look like an orange or grapefruit seed, but still far from being ripe. Some seed-pods ripen in four to five months from pollination to harvest of seed; others, from six to nine months. I do not know the reason for this, nor, as I have before mentioned, what determines the size of the seed-pod.

Another mystery to me is whether the time-lapse between ripening and sowing of seeds has any bearing on the time of germination and the number

of seedlings. I have read that seeds planted about two or three weeks after ripening will germinate in about two weeks. I tried this and the results were amazing. I started transplanting the largest seedlings about three weeks after germination. I continued transplanting daily to prevent crowding and loss of what might be unusual plants.

If you care to grow African Violets through pollination of your own plants, try this method. I feel sure you will have success and bring to us and the world more beautiful specimens of the flower we love—The African Violet.

AFRICAN VIOLETS RAISED UNDER GLASS

RUTH LOCKERT*
West Chicago, Illinois

Of course, to me, Violets raised anywhere are extremely interesting. We do not raise all our plants here in the greenhouse. We have not space enough or time. I buy new hybrids and raise some of the older varieties. It is very much easier to get plants to bloom in the greenhouse. Your light and sunlight can be regulated more easily. Humidity is so important, and by watering under benches, glass walls, or in alleys between benches, it is always possible to get the humid air Violets thrive in.

Problems in glasshouse gardening are quite different than in a home. Greenhouses seldom have warm enough temperatures. Most flowers and plants raised commercially are cool-growing. Violets will live in a day temperature of 60 degrees and nights of 45 or 50 degrees, but will not grow well or fast, so to have any success raise them by themselves. Many tropical plants, and other plants of the African Violet family such as Gloxinias, Gesneriads, and Episcias, will grow well under the same conditions as Violets. I have raised Gloxinias, but African Violets are the most popular.

Shading the greenhouse glass should begin, in this area, in April and be continued till September, or as long as the sun is hot. We find it necessary to screen inside with curtains or something the light will sift through. This may sound difficult, but is actually not hard at all.

It is such a help for a commercial grower, as well as collector, to go to conventions whenever it can be arranged. So much help is given on soil, fertilizing, and new methods of mixing and sterilizing your own soil. Sterilizing is a *must* even for the amateur. Meeting friends, learning others' experiences, all are to be considered in any hobby. We never can get too educated in something we are trying to do.

* Mrs. Lockert is not a member of any of the African Violet Clubs of Greater St. Louis, but this article was requested from her in order to include some material on greenhouse culture of African Violets.

There is much information, free for the asking. We are very new at this business, and I have picked up literature all over, and reading, with experience of course, is helpful. I still enjoy trading rare plants, and have quite a collection of unusual things.

I have a large collection of Begonias, Geraniums, Cacti, also many Violets, which was the beginning of this business, starting a very interesting and self-supporting business from a hobby.

Thanks for reading thus far, and hope you have become just a little more interested in growing Violets wherever it is possible. They are such fun in the home or greenhouse. Good growing to all, and learn. Much love and patience is required to become a good flower-grower.

MY HOBBY

MRS. JOSEPH GERSBACHER
President, Holly African Violet Society

When I first started to grow and collect my vast number of African Violets, I did not know there were so many varieties. We had a bungalow with nice sunroom windows on three sides, and large trees shaded my west windows. My plants in the west window got only sun when it was setting.

I could never pass a florist's shop without going in, and of course I came out with one or two plants. How quickly things began to happen as the weeks went by! My plants began to bloom, and that was all I needed to get me started on more plants. I also found that you have to stimulate root growth in African Violets to give good performance. The roots must be loose and you must have a good soil mixture.

I sent samples of soil my husband had mixed for me to the University of Missouri, at Columbia, and it was returned pronounced O.K., which pleased me very much. I plant my leaves in vermiculite to start them and cover them with wax paper in which a few holes have been drilled. This is a sterile inert medium for cut leaves and root growth. At first I was very proud of my blue African Violets, but as time went by I heard of new varieties and I went on a buying spree. I sent away for many others, waiting impatiently for the mail. Then we had our first show in Webster Groves and I bought many leaves and plants. I also joined a club. I had to move my plants to the basement, and now we have them under fluorescent lights of the industrial type.

I water my plants from the saucer when I think they are dry. I found out in the beginning that my trouble was watering either too much or not enough. I use only rain water or water obtained when my refrigerator is defrosted or that from my fish aquarium. I also feed my plants every two weeks and keep them clean from bugs. I water in the morning when the

temperature is rising. The reason for this is that if water is accidentally spilled on the leaves and the temperature falls to any extent, the evaporation of water may reduce the injury from chilling which causes brown spots on the leaves.

If your soil is porous there is little danger of over-watering. I use crushed flower-pot chips or chicken grit in the bottom of my pots to allow drainage. These are some of the things I had to learn. I think one of the most important things is a good, balanced, loose soil mixture. Good food, fresh air, humidity, light, and proper watering are also necessary. All this has been successful for me.

MISCELLANEOUS DATA ON THE AFRICAN VIOLET

THELMA USINGER
Amethyst African Violet Club

Many thousands of people from all parts of the world have seen and admired the Saintpaulias (African Violets) at the Missouri Botanical Garden since 1908; but not for thirty-eight years were they to become popular. A show was held in Atlanta, Georgia, in 1946, by a small group of people. A local society was then formed by those who had attended the show. From that beginning, the African Violet Society of America was brought into being.

The African Violet Society of America, Inc. now has over 18,000 members in the United States and foreign countries. Each member receives a quarterly magazine devoted to African Violet culture. Since variety is the spice of life, that surely applies to African Violets, for not only are there over 1,000 varieties, there is great variety in the method used to attain success by the men, women, and children who grow them.

African Violets can be grown in any window or by artificial light. Some people prefer to grow them in their basements under fluorescent lights; others prefer window-sills or shelves. Although African Violets need sunlight, strong rays must be filtered through curtains or tissue paper to prevent plant damage. Many methods are used to raise these plants, but one rule seems universal: If the plants are to grow symmetrically, they must be turned often.

Watering is important. Plants must not be over-watered, nor under-watered. Watering may be done from the top or bottom of the container. The type of water is dictated by preference, but it should be tepid. Water straight from the faucet, with faucet water allowed to stand over night, or rain water may be used. Plants should be watered only when the soil feels dry.

New plants may be started by placing a leaf in water in a small glass container (clear or colored). A pan or tray two inches deep should be prepared with very moist (not wet) vermiculite for planting the leaf when hair-line roots develop. Holes may be made in the vermiculite with a pencil

and the leaf inserted. The vermiculite can be pushed up loosely around the stem so that the leaf stands upright. The tray should be watered whenever the vermiculite feels dry. When the young plants are a fair size, use a spoon to lift them out and carefully separate the plantlets from the parent leaf into small pots or another tray. This time, the tray should be filled with vermiculite over a one-inch base of peat moss (humus). Proceed as mentioned before. The plants may stay in this mixture until ready for three-inch pots. I prefer this pan method to pots because it takes care of more plants and conserves space. The parent leaf can be re-rooted again if it is firm.

When the plants need to be transplanted to three-inch pots, a package of African Violet soil may be purchased, or you may mix your own from the following formula: 1 part soil, 1 part sand, 2 parts peat moss. Add a little bone meal and charcoal to the mixture. A small piece of broken pot should be placed over the hole in the bottom of the three-inch pot, which should be filled part way with the above mixture. Put the plant in the pot and gently hold up the leaves while spooning in dirt around the plants. Later, when the roots grow through the hole the plant needs repotting. To remove the plant hold the pot firmly in one hand while hitting the rim quite hard with a hammer. As a rule, the pot will break on both sides; if not, turn the pot around and strike it again. Replant in the larger pot without disturbing the roots. Again, you spoon in the dirt to fill the pot, and then water.

There is no need to "baby" the plants, but they should not be neglected either. When you bring a new plant home, wait several weeks before putting it with the other plants, until you are sure it is free of insects and disease.

It is not essential that you join an African Violet club to raise African Violets successfully. However, by doing so, you are given an opportunity to further your knowledge and to discuss your problems with people who enjoy the same hobby.

AN AFRICAN VIOLET GROWER

RUTH PENROD
President, County Belles African Violet Society

Mr. Harry O'Brien, of "Dirt Gardener" fame, who was the guest speaker at the dinner during the African Violet Convention held at the Chase Hotel, April 22, 23, 24, said in his speech that members of the Society were 50 per cent nuts and 50 per cent fuddy-duddies! Lo and behold! I picked up the July *Flower Grower* magazine, and there, in the article "The Weather-vane," the author, Montague Free, who is well known to flower-growers, quotes Mr. O'Brien and adds, "I would guess that these percentages are wrong

—75% nuts, 20% normal gardeners, and 5% fuddy-duddies is natural for any single plant society, most of whose members belong in the 'one man dog' class, profoundly uninterested in any plants except those to which they are fanatically devoted."

I guess I have fallen into the 100 per cent nut class as I have been bitten by the African Violet bug, and my other plants, much as I love them, will have to join the "Plants Must Go Club" so there will be more room for the Violets. African Violets have won my heart completely. Each day brings forth new discoveries, new thrills, and once in a while such joy to find a new little plantlet emerging from the soil that you have mixed and sterilized yourself. My friends and relatives alike think that I am "real gone" as I talk African Violets to any one who will listen. Well, I wondered about this "nut" business myself the other day as my seven-year-old nephew, whom I was visiting, whispered quite loudly to his playmate, "That's my Aunt Ruthie, she's crazy about African Violets." I smiled with the expectancy of a smile in return, but instead they both looked at me as if I were deadly poison. Were they looks of disgust or contempt? I looked for a hole to crawl in.

Just recently I read of putting lady-bugs around plants which had manure in the soil. The manure attracts small black flies which the lady-bugs devour. So out I went to the garden in search of lady-bugs, laughing and thinking to myself that I should have a butterfly net and a pith helmet. I wondered what the neighbors would think if they knew what I was hunting for. Just when the hunting became more than just a game of hide-and-seek, a car drove in the drive-way and out stepped my better-half; "what 'cha looking for, doll, lose something?" "Looking for lady-bugs," I called back, trying to snare one last evasive creature. "Say, you had better watch out or that man with the net will be out looking for you," he shouted. With that last remark I literally slithered in behind him into the house, taking a peek out the door to see if any one heard us.

Perhaps we are "nuts," we members of the African Violet Society, but some day you too may lose your heart to an African Violet and you'll not be a 75 per center or a fuddy-duddy but you'll be "real gone"—a real 100 per center. I suspect that both Mr. O'Brien and Mr. Free are both pretty "nuts" themselves, as Mr. Free has contributed greatly to the knowledge of African Violet culture by writing the book "All About African Violets" and Mr. O'Brien even, once in a while, writes about Maggie's African Violets.

BOOK REVIEWS:—

Songbirds in your Garden. By John K. Terres. 274 pp., illust. Thomas Y. Crowell Co., New York. 1953. $3.95.

Express highways, super-shopping areas and low ranch houses highlight the trend toward country living. Accompanying these major changes of scene new interests are being awakened in the out-of-doors. Suburbanites are seeking information on gardening, wild plants and animals. This book tells of a new type of bird-watching. The early morning bird trip in field and wood can be replaced by bidding the birds into your own yard. Terres explains in much detail the kinds of foods, the types of bird houses, baths and nesting sites that can be provided at little trouble and expense; and the book is easily read for all of this practical information is bound together by a series of beguiling bird stories.

Although his experience attracting nearly 100 species of birds has largely been in the vicinity of New York the information he presents can generally be applied throughout the country, and appendices are given for the kinds of birds and their favored foods for the whole United States. Terres encourages grosbeaks, orioles, sparrows and starlings alike although he recommends glassed-in feeders and swaying sticks or suet holders for the smaller birds. The chapter on ornamental plantings for birds lists shrubs and trees as Dogwood, Pin Cherry, Barberry and Cedar that offer food for birds and are attractive plantings as well. Coarse cereals, fruits, breads and especially nuts will attract birds all the year but the author emphasizes the importance of continuous winter feeding, for once the birds have recognized your feeding station they will depend upon it. Some of these techniques of attracting birds are new, some are modifications of old methods and one is as ancient as the first Americans, for, as Edwin Way Teale writes in the introduction of this book, the American Indians hung hollow gourds around their villages to provide nesting sites for purple martins.—Alice F. Tryon

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The Secret of the Green Thumb. By Henry and Rebecca Northen. 431 pp. The Ronald Press, New York. 1954. Price $5.00.

Regardless of how green your thumb happens to be, it will certainly be a little greener after you have read the "Secret of the Green Thumb" by Henry and Rebecca Northen. This new book is designed to give the average gardener an insight into the inner workings of that complicated system called a plant. The scientific facts which form the basis of our knowledge of plant growth and development are presented in non-technical language, and these facts are related to actual practice and garden care.

Not only have the authors achieved the difficult task of explaining tech-

nical facts and theories in a simple, easy-to-understand language, but they have even gone one step further. In their interesting and easy-going style, the reader actually finds himself enjoying the technical material. All in all, the book seems to fill a definite need and can be highly recommended for all garden enthusiasts.—R.G.

The California Academy—Lingnan Dawn Redwood Expedition. By J. Linsley Gressitt. Calif. Acad. Sci. Proc., Ser. IV, 28:25–58, 13 text-figs. San Francisco, July 15, 1953. $.60.

The Dawn Redwood *(Metasequoia glyptostroboides)* has been heralded as one of the epic-making plant discoveries of the 20th century. Much has already been written about this plant, both in scientific journals as well as newspapers. The present first-hand record by Dr. J. Linsley Gressitt, now of the Bernice P. Bishop Museum at Honolulu, is one of the liveliest and certainly the most comprehensive description of the Dawn Redwood in its native habitat that has yet appeared in print.

In 1948, the California Academy of Sciences in San Francisco sent Dr. Gressitt and a crew recruited from Lingnan University at Canton, China, to the only locality the Metasequoia is known to grow—30 to 75 miles south of Wan Hsien on the Yangtze River on the borders of Szechuan and Hupeh Provinces below Chungking. The expedition spent nearly five months in this region. The discovery of the living Dawn Redwood in this area by the Chinese botanist, T. Wang, in 1944 brought to life what previously had been known only as fossils. Formerly, the *Metasequoia* occurred over wide areas in the western hemisphere, and recently it has been shown that the *Metasequoia* was abundant in western United States some thirty million years ago.

In its present home, the Dawn Redwood has long suffered from the ravages of mankind. However, the expedition counted 1219 *Metasequoia* trees, and the author reports that the tree is still reproducing quite freely. The largest specimen found was 115 feet tall and 8 feet in diameter.

The 34-page booklet is illustrated by 13 excellent photographs of the Dawn Redwood in the wild, taken by the author.—F. G. Meyer.

THE FIRST WORLD ORCHID CONFERENCE

Elsewhere in this BULLETIN will be found mention of the Orchid Exhibition to be staged at the Garden, October 15–17, in connection with the World Orchid Conference, sponsored by the American Orchid Society, Inc., with the cooperation of the Missouri Botanical Garden and the Orchid Society of Greater St. Louis, with headquarters at the Hotel Chase. The tentative program is as follows:

FRIDAY, OCTOBER 15

9:00 a. m. Registration and General Meeting—Regency Room, Hotel Chase.
Mr. George W. Butterworth, Sr., President of the American Orchid Society, Inc., presiding.

10:00 a. m. "What is a Fine Orchid?"—Regency Room.
Moderator, G. Robert Lowry, Missouri Botanical Garden.
Mr. Ira Haupt (New York), Mr. Robert Scully (Florida), Mrs. L. Sherman Adams (Massachusetts), Mr. William Kirch (Honolulu, Hawaii), Mr. Gordon Hoyt (Washington), Mr. Takumi Kono (Hilo, Hawaii), and others.

2:00 p. m. Orchid Exhibition, Missouri Botanical Garden.
Group discussions on special features.
Tour of Missouri Botanical Garden and Museum.

8:00 p. m. Symposium: "Recent Advances in Orchid Knowledge"—Regency Room.
"Pure Research and Its Application"—Dr. John T. Curtis, Prof. of Botany, University of Wisconsin.
"New Developments in Growing Methods and Equipment"—Dr. O. Wesley Davidson, Prof. of Horticulture, Rutgers University.
"Orchid Diseases and Their Treatment"—Dr. D. D. Jensen, Assoc. Prof. of Entomology, University of California.

SATURDAY, OCTOBER 16

9:00 a. m. Professional Growers' Session—Regency Room, Hotel Chase.
Moderator—Joseph Hampton, B. O. Bracey Co.
Several short talks by selected professional growers.

12:30 p. m. Luncheon—Tiara Room, Park Plaza Hotel.
Speaker—Dr. Gustav A. L. Mehlquist, Professor of Floriculture, University of Connecticut.

3:00 p. m. Public Education Session—Tiara Lounge, Park Plaza Hotel.
Moderator—Gordon W. Dillon, American Orchid Society, Inc.
"Orchid Societies, Their Problems and Hopes."
"Orchid Publications, Their Problems and Responsibilities."
"Orchid Shows."

8:00 p. m. Amateur Growers' Session—Regency Room.
Moderator—Mrs. Rebecca T. Northen, author of "Home Orchid Growing."

SUNDAY, OCTOBER 17

9:00 a. m. Science and Research Session—Regency Room.
Panel—Dr. Lewis Knudson, Cornell University, Chairman; Dr. John T. Curtis, Dr. O. Wesley Davidson, Dr. D. D. Jensen, Dr. Gustav A. L. Mehlquist.

11:30 a. m. Busses will leave the Chase Hotel for Gray Summit Orchid Range of Missouri Botanical Garden.

1:00 p. m. Lunch, courtesy of Missouri Botanical Garden.

2:00 p. m. Tour of Gray Summit Orchid Range. Busses return to Hotel Chase.

7:30 p. m. Banquet (Informal—Reservations) — Starlight Roof, Hotel Chase.
Résume of Sessions.
Summary of Conference Accomplishments.
Presentation of Conference Awards.

MONDAY, OCTOBER 18

For those who are interested a visit to see the plastic greenhouses of Mr. and Mrs. F. O. Reh, of Belleville, Illinois, will be possible on the day following the conclusion of the Conference. Arrangements can be made directly with Mr. and Mrs. Reh.

REGISTRATION

The registration fee will be $5.00 for each person. Tickets for individual activities are separately priced, and total $17.75, registration included. However, a special rate of $15.00 for advance registration will provide registration badge and ticket booklet for all scheduled activities. Please use registration envelope, making check or money order payable to the American Orchid Society, Inc. Send in your registration at once. Badge, ticket and program will be ready for you on your arrival.

REGISTRATION FORMS

For registration envelopes, programs, hotel reservation cards, etc., write to Chairman, Local Committee on Registration, Mr. John E. Nies, 7 Hawthorne Court, Kirkwood 22, Missouri, or First World Orchid Conference, American Orchid Society, Inc., Botanical Museum of Harvard University, Cambridge, Mass.

HORTICULTURAL COURSES IN 1954 AND 1955

The following courses in horticulture will be given by the Garden during 1954 and 1955. Except for the Orchid course all will be given in the Experimental Greenhouse at the Garden, 2315 Tower Grove Avenue. Please send all registration fees to:

Horticultural Courses,
Missouri Botanical Garden,
2315 Tower Grove Ave.,
St. Louis 10, Mo.

As materials for each course are purchased after the closing registration date no registration fees can be refunded after the last day of registration for any particular course.

Course I—Grafting and Budding

Two Sections (Indicate your choice):

1. Friday, Sept. 17, 8:00 P. M., or
2. Saturday, Sept. 18, 2:00 P. M.

Registration.—Sept. 1–Sept. 16 for individual Friends of the Garden, others Sept. 10–Sept. 16. Limited to 30.

This three-hour course is offered for those amateur gardeners who wish to learn something of the principles of grafting. A lecture will explain the basic fundamentals of grafting along with detailed descriptions of the various types of grafts and their uses. A work session will consist of supervised grafting on practice material; following this each student will graft a lamartine lilac on privet stock and bud a hybrid tea rose on a multiflora rose stock. Each student will be privileged to take home his grafted material.

Registration Fee, $5.00.

Course II—Bulb Forcing

Nine Sections (Indicate your choice):

1. Wednesday, Oct. 27, 1:30–4:00 P. M.

or

2. Thursday, Oct. 28, 9:30–12:00 M.

or

3. Friday, Oct. 29, 1:30–4:00 P. M.

or

4. Wednesday, Nov. 3, 1:30–4:00 P. M.

or

5. Thursday, Nov. 4, 9:30–12:00 M.

or

6. Friday, Nov. 5, 1:30–4:00 P. M.

or

7. Wednesday, Nov. 10, 1:30–4:00 P. M.

or

8. Thursday, Nov. 11, 9:30–12:00 M.

or

9. Friday, Nov. 12, 1:30–4:00 P. M.

Registration.—Sept. 15–Oct. 20 for individual Friends of the Garden, others Oct. 1–Oct. 20. Limited to 200.

Forcing spring bulbs in the home is one of the easiest, quickest and cheapest methods by which the home gardener can obtain a succession of attractive flowers. A brief lecture will explain the methods and techniques of bulb forcing. Following this, each student will be given five pots of bulbs (one pot each of tulips, narcissus, paperwhites, hyacinths and calla lily) to plant. These pots will be stored in the Garden cold-frames until ready to flower. At this time each student is notified by post-card that his bulbs are ready to be picked up for forcing in the home. Since the greenhouse is used for various projects the Garden cannot assume responsibility for any bulbs remaining on the premises longer than two weeks after notification cards are sent out.

Registration Fee, $5.00.

Course III—Plant Propagation

Four Sections (Indicate your choice):

1. Friday, Jan. 21, 8:00–10:00 P. M. and
   Friday, Jan. 28, 8:00–10:00 P. M.

or

2. Monday, Jan. 24, 8:00–10:00 P. M. and
   Monday, Jan. 31, 8:00–10:00 P. M.

or

3. Wednesday, Feb. 2, 1:30–3:30 P. M. and
   Wednesday, Feb. 9, 1:30–3:30 P. M.

or

4. Friday, Feb. 4, 8:00–10:00 P. M. and
   Friday, Feb. 11, 8:00–10:00 P. M.

Registration.—Dec. 15–Jan. 15 for individual Friends of the Garden, others Jan. 2–Jan. 15. Limited to 60.

The course in plant propagation will be offered in two periods of two hours each. The first session will give the student a general background in the basic methods of plant propagation with actual practice in the making of cuttings. Each student will receive a propagation pan and cuttings to

take home. The second session will deal with new methods in plant propagation. A lecture will describe these methods and show how they can be adapted for home use. In the practice session, each student will receive one full size plastic-covered propagating unit (lippigator) with a variety of plant material.

Registration Fee covering both periods, $10.00.

Course IV—Embryo Culture Technique

One Section—Friday, Feb. 18, 8:00–10:00 P. M.

Registration.—Feb. 1–Feb. 15 for individual Friends of the Garden, others Feb. 5–Feb. 15. Limited to 10.

This course is being offered at the request of several plant breeders who want to learn this rather specialized technique which is of benefit to the professional as well as to the amateur plant breeder.

Registration Fee, $10.00.

Course V—Orchids for Amateurs

One Section—Thursday, April 14, 10:00 A. M.–3:00 P. M.

Place.—Orchid Greenhouse, Missouri Botanical Garden Arboretum, Gray Summit, Mo.

Registration.—March 15–April 14 for individual Friends of the Garden, others April 1–April 14. Limited to 25.

Morning: 10:00–12:00 A. M., Tour of the greenhouse with a discussion of orchid watering, ventilating, and lighting. Lunch: 12:00–1:00, coffee furnished. Afternoon: 1:00–3:00, Discussion period. Topics: Orchid Insects and Diseases, Controlled Flowering, Orchids from Seed, and Potting and Vegetative Propagation.

Registration Fee, $15.00.

Course VI—Spring Horticulture

Four Sections (each meets five times; indicate your choice):

1. Monday morning, 9–12, March 28, April 4, 11, 18, 25,

or

2. Monday afternoon, 1–4, March 28, April 4, 11, 18, 25,

or

3. Wednesday afternoon, 1–4, March 30, April 6, 13, 20, 27,

or

4. Friday morning, 9–12, April 1, 8, 15, 22, 29.

Registration.—March 1–25 for individual Friends of the Garden, others March 10–25. Limited to 85.

The Spring Horticulture course is designed to give the beginning gardener a background of general information on the sowing, transplanting and culture of annual and perennial plants. It is given once each week for five weeks with a lecture and lab session lasting 3 hours. Each student is given 4 metal seedling flats and will be instructed in the sowing and transplanting of seedlings in sufficient quantity to fill the flats. When outside conditions permit, each student can remove his material from the greenhouse for planting into the garden.

The *Registration Fee* covers all materials, including flats—$15.00.

COMING ATTRACTIONS IN THE FLORAL DISPLAY HOUSE

From mid-September to mid-October the Garden will play host for a series of exhibitions arranged by various horticultural societies from St. Louis and elsewhere.

CACTUS AND SUCCULENT SHOW

September 18 and 19

This will be the annual fall show of the Henry Shaw Cactus and Succulent Society and will be open to the public on Saturday, September 18, at noon, and Sunday, September 19, from 9:00 a. m. until 5:00 p. m.

HARVEST SHOW

September 24, 25, and 26

This show, including fruits, vegetables, and flowers, will be staged by the St. Louis Horticultural Society with the cooperation of many of the more specialized plant societies in the St. Louis area. There will be special exhibits by the Iris Society, the Dahlia Society, the Council of Men's Garden Clubs, the St. Louis Unit of the Herb Society of America, and the Nurserymen's Association. Plans call for extensive outside displays and demonstrations as well as exhibits in the Floral Display House itself. Since a flower show is never more interesting than when the various experts are busy putting it together, the Friends of the Garden are being invited to what can only be described as a "pre-preview" on Friday the 24th from 8:00 until 10:00 p. m. The show will be open to the public not only all day Saturday and Sunday, but on Saturday until 10:00 p. m. as well.

DAHLIA SHOW

October 2 and 3

This will be the annual fall show of the St. Louis Dahlia and Chrysanthemum Society and will be open to the public on Saturday afternoon and Sunday. From 8:00 to 10:00 p. m. on October 2 the show will be open to Friends of the Garden and members of the Society.

ORCHID WORLD CONFERENCE

October 15, 16, and 17

In connection with the First World Orchid Conference to be held in St. Louis on these dates under the auspices of the Orchid Society of America, the Greater St. Louis Orchid Society, and the Missouri Botanical Garden, there will be an Orchid exhibition in the Floral Display House. It will include competitive and educational exhibits from all over the world and should prove to be one of the most spectacular flower shows ever put on in St. Louis.

VEILED PROPHET QUEEN'S BOUQUET

October 6

The orchid bouquet of the Queen of the Veiled Prophet, which is presented to her by the Garden at the Veiled Prophet's Ball, will be on display in the Floral Display House at the Garden on the day after the ball, October 6.

NOTES

Another course for Amateurs.—Elsewhere in the BULLETIN will be found a description of the courses in Horticulture for Amateurs which are being offered at the Garden in 1954-55. One of these is being given for the first time this year. It will include a lecture, a demonstration and a practice session on the grafting and budding of woody plants. As for all the other courses offered this year, there will be two registration periods; one limited to the Friends of the Garden and a second period open to the public at large.

During the summer Dr. Woodson has made a series of trips to the Caribbean area in connection with his studies of the Apocynaceae, a family of drug plants which are becoming of increasing economic importance.

Among our recent visitors was Mr. Charles Miller, an old resident of St. Louis who is now in his ninety-second year. He was particularly interested in the old buildings built during Mr. Shaw's day and told us of attending a children's party in what is now Mr. Ulrici's office.

August twenty-fifth marked the sixty-fifth anniversary of the death of Henry Shaw. In commemoration of this event, Mr. John E. Nies, President of the Horticultural Council of the Missouri Botanical Garden, and Mr. John A. Bryan, of the Henry Shaw Memorial Association, placed a wreath on the tomb of Henry Shaw. The wreath, prepared by Mrs. John E. Nies, consisted of Magnolia leaves and Orchids grown at the Garden.

Dr. R. M. Tryon has received a grant from the National Science Foundation which will make it possible for him to monograph the ferns of Peru.

The grant will allow him to visit Peru and will pay for a technical assistant who will take over some of Dr. Tryon's routine chores in the Herbarium. The ferns of tropical areas are very poorly understood and Dr. Tryon's monograph will be the first comprehensive study of any considerable area in the new world tropics. It will be useful not only in Peru but very generally over wide areas of South and Central America.

This year Dr. Charles Heiser again visited the Garden at the close of summer school at the Indiana University with a party of young people. They spent the afternoon in the library, herbarium and laboratories and were entertained at a picnic supper in the experimental plot by the graduate students and research assistants. They then went to the Arboretum where they stayed for two nights and a day, making their headquarters in Dr. Anderson's laboratory.

Early in the summer the second number of this year's ANNALS OF THE MISSOURI BOTANICAL GARDEN appeared in its trim brown cover. The major portion of this number is taken up with Dr. John Dwyer's monograph of Tachigalia, a genus of tropical trees. Dr. Dwyer came to St. Louis last year as the new head of the Biology Department of St. Louis University. Since he is a trained taxonomist and needs a large herbarium for using this training efficiently, he was made a Research Associate of the Missouri Botanical Garden. This mutually helpful arrangement gives him a big herbarium and botanical library in which to carry on his research; while to the Garden it means an additional trained member of the scientific staff. His work helps to keep collections in better order, to bring some of our valuable old material to scientific notice and usefulness, and, in general, to make the work of the herbarium go forward more smoothly. The remainder of the number is taken up with an article by Dr. Anderson and Dr. Louis O. Williams. Dr. Williams received his doctorate in the Henry Shaw School of Botany nearly twenty years ago and is now on the staff of the Escuela Agricola Panamericana in the highlands of Honduras. Over wide areas in these Central American mountains, corn and sorghum are planted together in fields prepared not by plowing but by clearing and piling the brushy thorn scrub and setting it afire. This operation kills weed seeds, clears the field, and mellows the soil so that planting can be done with an old-fashioned planting stick and no further apparatus. The corn and sorghum are planted in the same field at the same time but are harvested at different times of the year. This curious survival of a very primitive way of growing crops is of some scientific interest, and Dr. Williams' clear and detailed pictures make a permanent record of it.

THE MISSOURI BOTANICAL GARDEN

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SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden carries on the garden established by Henry Shaw over a century ago at "Tower Grove," his country home. It is a private institution with no public support from city or state. The old stone walls and cast-iron fences, the Linnean House, the Museum, the Mausoleum and the "Old Residence" all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's Day and Christmas) from 9:00 a. m. until 7:00 p. m., April to November, and until 6:00 p. m., November to April, though the greenhouses close at 5:00 p. m. Tower Grove, itself, Mr. Shaw's old residence, is open from 1 until 4. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., opposite the junction of routes 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

Cattleya O'Brieniana alba

Orchids at the Missouri Botanical Garden

Volume XLII October, 1954 Number 8

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Missouri Botanical Garden Bulletin

Vol. XLII OCTOBER, 1954 No. 8

ORCHIDS AT THE MISSOURI BOTANICAL GARDEN — YESTERDAY, TODAY AND TOMORROW

ROBERT AND VALDA LOWRY

Many yesterdays have come and gone since orchids made their first arrival at the Missouri Botanical Garden. In fact, about three-fourths of a century of yesterdays mark a very long road back to that day in the late 1870's when Mrs. Henry T. Blow presented a small collection of Brazilian orchids to Mr. Henry Shaw, the founder of the Garden. Since that time, each day has left its bit of history in the making of the huge and varied collection of orchids now owned by the Garden.

As in all history, there has been every kind of yesterday woven into this eventful and colorful story which might well be named "The Rise of the Queen of Flowers in St. Louis." There have been unhappy days as well as joyful, and even a few tragedies appear among the triumphs. Perhaps one of the saddest yesterdays for orchids at the Garden was in 1903 when a disastrous fire destroyed a large portion of the collection and left the remainder badly damaged. By that date the collection had grown to about 550 plants. Shortly after the fire, Dr. Trelease, the first director of the Garden, made a trip to Mexico and Central America to collect more plants. An interesting and human touch was that the tragedy prompted the New York Botanical Garden to come forward with a gift of 84 plants. Evidently, the fire served as a spur to activity in the orchid department during the following year, because by 1905 the orchids at the Garden were reputed to have reached their previous standing.

The year 1906 brought one of the brightest yesterdays for orchids at the Garden. That was the day that Mr. George H. Pring came to work at the Missouri Botanical Garden. Besides an intense interest in orchids, this young man had the advantage of having been trained at the Royal Botanic Gardens at Kew, England, one of the first institutions in the world to establish orchids and study their culture in greenhouses. Mr. Pring was immediately placed in charge of the orchid department, a post which he has held for the

past forty-eight years. Under his shepherding, the number of plants has grown from about 500 to approximately 50,000, and an extensive program of developing and improving the collection has moved gradually ahead. Besides work on propagation, investigation of the problems of growing orchids in the variable and often obstinate climate of the Middle West was constantly being carried on.

No doubt, every human quality has figured at some time and some place in the collecting and developing of these thousands of orchids. However, one trait which shows itself on virtually every page of the record is that of generosity. Just as Mr. Shaw so generously gave the Garden itself, many people have given in the same spirit to the Garden. How else could an institution founded solely for the sake of beauty and knowledge of horticulture, operating on a non-profit basis, ever have afforded to build up the orchid collection to its present status?

In 1918, there was a veritable spill-over in the stream of human kindness and generosity which flows through this story like a bright river. That year, Mr. D. S. Brown, of Kirkwood, Missouri, a man renowned for his interest in rare and valuable orchid plants, donated to the Garden his entire collection which he had spent thirty years in accumulating. Besides hundreds of outstanding species and early hybrids of the Cattleya group, the gift contained rare botanical specimens and many of Mr. Brown's favorite "lady-slipper" orchids, the Paphiopedilums (Cypripediums). Some of these would have been extremely difficult to duplicate at that time. Among them were twelve plants of *P. Maudiae* var. *magnificum* and *P. Holdenii*, two green orchids of superior strains which Mr. Brown had imported from England and even now, thirty-five years later, are considered exceptional. Through propagation by division, these twelve plants have been multiplied so that now there are 500 in the Garden collection. It was also through Mr. Brown's gift that the Garden acquired such rare old plants as *Cattleya Bowringiana* var. *splendens*, *C. Dusseldorffei* var. *Undine*, *C. Skinneri* var. *alba*, *C.* "Prince Edward" and *C. O'Brieniana alba*, as well as many others valued highly today as parents of future hybrids.

There have been three other outstanding and large bequests to the Garden. The first of these arrived in 1926 from Mr. C. W. Powell, of Balboa, Canal Zone. Mr. Powell, from his vantage spot in the tropics, had built up a very fine collection of Central American orchids. When this was donated to the Missouri Botanical Garden, probably there were envious twinges in every orchid circle around the globe. The second giant wave of generosity to wash upon the Garden's shores came in 1931. That year, Dwight F. Davis, Governor-General of the Philippine Islands, presented to the Garden his collection of Philippine orchids, including a number of

Cattleya Bowringiana splendens, from the D. S. Brown collection.

species and varieties completely new to St. Louis. The most recent large gift was received in the years 1949, 1950 and 1951, from Mr. Herbert L. Dillon of Long Island, New York, and comprised about 3000 plants, mostly Cattleya species and hybrids.

Obviously, the bulk of the plants donated to the Garden have come through the desire of many people to lend support to a public institution dedicated to horticulture. The generous tide has also been due to the willingness of orchid growers, private and commercial alike, to share in neighborly fashion an occasional worthwhile plant. Through the years many exchanges have been arranged, resulting in plants which otherwise the Garden could not have afforded.

As one walks through the greenhouses at Gray Summit, he is impressed by the beauty of the orchids and the wide variety of odd species. There is another impression too—an intangible quality which he feels rather than sees. Perhaps it is a subconscious awareness of all the mysterious yesterdays in all the far-away places where these exotic plants grew before they came to the greenhouse bench. Certainly the chain of events accompanying the arrival of virtually every plant, whether it came from a laboratory flask or a tropical forest, would made a fascinating story in itself. As an example,

why not reconstruct just a few incidents from the life of one plant in the Garden's collection. Picking at random, we might choose an exceptionally fine specimen which came to the Garden directly from the jungle. The facts for the story could be taken from the memories of a man who, without a doubt, has been responsible for more of the orchid plants at the Garden than any other one person. High on its perch atop the uppermost branch of a giant jungle tree, a very fine plant of *Cattleya Trianae* stretched its lusty green leaves to the humid morning. On some long-ago yesterday, the fertile seed which produced it had evidently been carried by a vagrant Pacific trade-wind to a crevice in the tree's rough bark. There it had germinated and, clinging to its leafy haven, it had flourished in an abundance of sun, wind and rain. As if aware of its excellence and its practically inaccesible stronghold so high above the tangle of roots, plants, and vines which ensnared its tree, the proud *Cattleya Trianae* seemed to smile down in an extremely taunting way. At least that was the impression received by the orchid collector who stood far below on a narrow trail gazing through field-glasses at the wonderful plant.

This silent jungle scene could have been both the beginning and the end of this story had not this particular orchid hunter been blessed with a special gift for acquiring what he wanted. "That fine plant has to come down," the orchid collector said to his native guides. They only shook their heads, for they knew it would take hours of laborious hacking away at the jungle growth before even the tree trunk could be reached. For a while they remained adamant, but finally, through much bribing and oratorical wheedling, the collector persuaded them into the difficult feat of bringing down the coveted prize. That was a poignant moment of triumph for Mr. Pring, who, as you may have suspected, was the collector involved in this bit of Garden history. To relive that moment, Mr. Pring needs only to walk into the *Cattleya Trianae* house at Gray Summit. There, hanging in a favored spot among its several divisions and numerous progeny, is that same proud *Trianae*, many years older, but still vigorous and perhaps still smiling. Incidentally, this plant was given the varietal name "D. S. Brown." Because of its superior quality and vigor, it has been used frequently as a progenitor of many of the Garden's *Trianae* hybrids. Among its offspring are such outstanding plants as *Cattleya* "A. A. Hunter" (*C. Trianae* var. "D. S. Brown" × *C. Nelsoni)* and the Garden's own cross, *B.C.* "Henri Constantin" var. "Henry Shaw," which won an Award of Merit from the American Orchid Society in 1953.

From that first memorable trip to the tropics, Mr. Pring returned with some 5,000 Cattleya plants, mostly varieties of *C. Trianae* and *C. Schroederae*. Through an exchange with Mr. C. W. Powell of Balboa, he also brought

back about 200 botanical orchids. In all, the Garden acquired 39 species and varieties which were introduced to this country for the first time.

Many more plants were obtained through another trip to the tropics in 1926. That trip was also instrumental in establishing the Garden's tropical station at Balboa, Canal Zone. This station proved to be an unparalleled aid in the collecting of tropical orchids as well as in studying plants under tropical conditions. During its existence, the station has been headed by three managers, successively: Mr. C. W. Powell, Mr. A. A. Hunter, and Mr. Paul A. Allen. Each of these men played important parts in many yesterdays connected with orchids at the Garden. Besides the numerous plants collected through this station, many valuable dried specimens were obtained for the Garden herbarium. Mr. Allen was especially successful in discovering rare and valuable plants. Probably his outstanding achievements were the discovery of *Sobralia Powellii* and the rediscovery of *Oncidium Powellii.*

As industry and population grew in St. Louis, smoke and smudge caused atmospheric conditions to become deplorable for orchids. In 1924, the Garden's Board of Trustees decided to purchase a tract of land outside the smoke area where a range of greenhouses could be built to house the orchid collection. Accordingly, 1300 acres near Gray Summit, Missouri, about 35 miles southwest of St. Louis, were acquired in 1925. By the end of 1926, a range of eight greenhouses had been erected and the entire orchid collection was moved to the new extension. True, having the orchids thirty-five miles away from the City Garden has occasionally presented problems, but the advantages of better growing conditions have always outweighed the inconveniences.

This panorama of orchid progress at the Garden could in no way be complete without a tribute to the many yesterdays in the laboratories where thousands of hybrids of numerous genera have emerged from seed. Elinor Alberts (later Mrs. David H. Linder) was contracted to handle the seedling work. She was the first person at the Garden to use the symbiotic (fungus) method in germinating seed. Along with the sowing and germinating of seed, many phases of orchid culture were investigated.

That the Missouri Botanical Garden was outstanding in its success with orchid hybridizing is evidenced by two significant events. The first, in 1920, was the flowering of the first hybrid orchid developed by the Garden. This plant, one of the "difficult-to-germinate" Paphiopedilums, was a cross between *P. barbatum Crossii* and *P. Harrisianum superbum.* It was named *Paphiopedilum* "D. S. Brown." Just ten years later, in 1930, the Garden received an award at the American Orchid Society show at Washington, D. C., for a demonstration by Mrs. Linder of the development of orchid plants from seed.

Epidendrum polybulbon.

By 1931, there were so many hybrid seedlings that it became necessary to construct three new greenhouses at the orchid range at Gray Summit. As the seedlings developed they required more and more room, and it was considered prudent to curtail the hybridizing program, at least for a time. By 1937, forty different hybrids, all of them in quantity, had developed to blooming size. The superior vigor and size of many of these hybrid plants and the deeper coloring and heavier texture of their flowers compared to those of species made it apparent that a return to hybridizing was necessary if the Garden's orchids were to keep pace with modern hybrids. Consequently, in the latter part of 1937, a laboratory was equipped at the experimental greenhouse in St. Louis. There, along with hybridization and seed-sowing, experiments were continued with various culture media, seed-sterilizing solutions, effects of normal and artificial light, and feeding solutions. Last, but not least, investigation was begun in testing the value and effect of gravel culture on the growing and flowering of orchids. This entire experimental project was carried on during the years 1937-46 by Dr. David C. Fairburn.

In 1939, Mr. Pring purchased in England a large group of superior bi-generic hybrids, with the genus Cattleya predominating, to serve as a nucleus

of worthy breeding plants. That was a most notable yesterday in the development of Garden orchids. From those plants have come many of our finest hybrids such as: *Laeliocattleya* "Dr. George T. Moore," *L.C.* "St. Louis," *L.C.* "Mimi Koehler," and *Brassolaeliocattleya* "Washington Centennial." The great number and variety of orchid plants at the Garden afford a succession of rare and exotic blooms throughout the year.

Since the first small display of blooming epiphytic orchids at the Garden's Christmas show in 1918, St. Louisans have become more orchid-conscious. This probably is due, in a large measure, to the ever-changing variety of orchids which can be shown in the Garden's alcoves every week of the year, as well as to the huge orchid show taking place annually during the month of February.

Beginning in 1925, the Missouri Botanical Garden has annually presented to the Veiled Prophet's "Queen of Love and Beauty" a bouquet of rare and enchanting orchids, sometimes consisting of as many as 300–400 flowers. It is carried by the beautiful young maiden to the throne where, in a setting of royal pageantry, she is crowned. After the magnificent ball, the bouquet is displayed for a day at the Garden—a symbol of the countless yesterdays which have made possible so great a gift of beauty.

TODAY

Orchids are more popular at the Missouri Botanical Garden today than ever before. From far and wide, visitors come not only to see their beauty and to enjoy their charm, but also to learn about their culture. This is because in the past decade, throughout the United States, there has arisen a new hobby—that of collecting and growing orchids at home. Most amateurs grow their orchids in small greenhouses, while many are growing them in Wardian cases or even on window sills.

Because of the speed of modern transportation, as well as the new asymbiotic methods of seedling culture, orchids are being brought into the lives of the American public in ways which a few years ago would have been impossible. All of a sudden, every one has discovered that orchids are so much more than just the top word in glamour for a lady's shoulder on the gala occasions in her social life. Orchids are for the home!

People are amazed to find that there are so many different kinds of beautiful blooms to be found in one of the largest and most varied of all plant families. Actually, there are types of orchids suitable for every occasion where flowers are in order. Whether one wants a striking and different centerpiece of lacy fern and soft white Phalaenopsis for a bridal luncheon, or just a bright accent of tiny golden Oncidiums for the hall table, usually they can be had. If one doesn't raise these "new" flowers in his own green-

house, he can buy them from his florist, and usually at a comparatively moderate price. No wonder the demand for orchids increases day by day! They are a new challenge to the hobbyist, particularly in the Middle West, as something different to be grown and flowered in the greenhouse.

This trend has placed another responsibility on the Missouri Botanical Garden—that of supplying information on the culture of orchids in the Middle West. How fortunate that the Garden has been so well prepared by all those yesterdays of caring for and developing the large and varied orchid collection!

As the trail of yesterdays grows dim, the realities of today rush in and surround us. Connecting the past and the present, however, is a deep reservoir filled with the cultural experiences acquired through seventy-five years of developing and maintaining orchids in an area so alien to their natural habitat. From all these lessons of yesterday there must be several which could make today's problems less difficult for the beginning orchid grower. At best, his road is a bumpy one. After months of trying to acquire all the cultural knowledge possible, he often finds himself certain only of the fact that there are "almost as many ideas as men." However, there is one opinion that he finds readily agreed upon by every source: that orchid plants will grow luxuriantly in any location where the proper balance of light, air, heat, and moisture exists.

But where, asks the inquiring midwestern grower, should he draw his information for the right amount of these four all-important ingredients? How can he get that elusive "proper balance" which growers everywhere talk about? Should he adopt the methods used in sections of our country where temperature and maximum sunlight are fairly uniform the year around? Can he grow his plants by the same plan used where humidity fluctuates from average to a degree where leather goods mildew merely from spending a night in the clothes closet? Should he perhaps follow directions used for keeping orchids happy in areas where heavy fogs and cool nights are usual the year around? Should he follow the directions of orchid-growers who are located 2000 or more feet above sea level? Obviously, he cannot wisely adopt directions given for any of these areas just described. These sections are all blessed with natural advantages for orchid culture which the midwestern grower will never receive from nature. One of his major problems will be creating, either manually or mechanically, substitutes for those natural conditions. There will be many times when the methods he employs would be unnecessary or even foolhardy in places more naturally adapted to orchid culture.

In thinking about orchids, we like to remember the way they grow in their natural habitat. The epyphytic types seem to thrive best in a tree-top where they receive an abundance of sun, wind, and rain. To us, that is

really "the key to the situation." Doesn't it follow that if these plants can be given, as nearly as possible, the same conditions in which they thrive in nature, they should thrive anywhere, no matter what part of the country? The confusion, it seems, all springs from the fact that giving orchids an abundance of sun, wind (air), and rain (water) requires widely different methods in different areas.

Here in the Midwest, particularly during our scorching, dry summers, proportioning the correct amount of water for orchids is probably the most asked-about problem. The amateur who purchases his plants from a section of the country which normally has high humidity is often told that too much watering for orchids is dangerous. He is instructed to water his plants well, let them dry out thoroughly, and then soak them again. During our extremely hot, dry season, from May until September, we have found it quite easy to lose a plant by such a watering method. Throughout this central belt we feel that far more plants have been lost by under-watering and improper potting methods than have been lost by over-watering. In the dry midwestern summers, orchids demand an abundance of water. It is needed to help raise normally low humidity, to lower the excessive heat in greenhouses, to check the over-rapid loss of plant moisture, and to supply the plants' root systems. We find that the need for water at the roots is best supplied by keeping the potting medium moist at all times. With a little experience the grower soon learns the technique required in his own particular growing-house for keeping the medium in this condition. By correlating procedures, he can, in one operation, give the necessary water required to take care of excessive heat and low humidity.

We realize that this idea of keeping the potting medium moist is directly opposite from that prevailing in many sections of the country. Repeatedly, one hears or reads the statement that orchid plants cannot develop strong root systems in a constantly moist medium. For our area, that statement is not true. The condition which orchid roots cannot tolerate is one which will not permit *excess* water to drain away or evaporate. If the medium drains well and there is a proper balance of the other growing factors, orchids grow luxuriantly in a constantly moist medium. The best demonstration of this fact can be seen by hanging a mature, well-established Cattleya plant in a bright spot in the greenhouse. During every bright day in summer, this plant can be watered—not heavily soaked, but finely sprayed, blending air and water, until the osmunda fiber is wet throughout. If the plant is potted properly, the excess water will drain away rapidly and the abundance of heat, light, and circulating air will cause much of the remaining water to evaporate gradually. This procedure, carried out every day except during cloudy or rainy weather, will cause this "test plant" to develop vigorous roots and robust new growths.

By no means are we advancing the idea that every Cattleya plant in every collection in the Middle West should be grown in a hanging position. However, the only impractical angle to such an idea would probably be the lack of available space. We feel that one needs only to observe a single plant growing in such a manner to realize that orchids can and will prosper by the use of an abundance of water *if* applied when the high temperature demands it and if light and fresh air are available. From watching this orchid plant thrive in its hanging position, the grower will find himself with the desire to duplicate as nearly as possible the same growing conditions for his plants on the benches. Realizing that these bench plants drain more slowly, receive less air circulation, and shade each other a certain amount, he will modify the watering just enough to keep the factors in balance. Because they receive a little less light, heat, and air circulation, with a little less water, the potting medium of the bench plants can be kept at the same degree of moistness as that of the hanging plant. Logically, the grower will then want to give the bench plants as much light and as much space between the pots for air movement as is practical.

Many orchid-growers shudder at the thought of well-established Cattleyas growing in a medium covered with a blanket of moss. It is true that both the pots and potting medium of plants growing in a hot, humid but stagnant atmosphere will develop a dark, slimy surface. This condition is an indication of either poor light or insufficient air circulation and should be remedied immediately. In our area, however, we feel that the gradual development of a cushion of green moss over the surface of the potting medium is evidence that the plants are receiving sufficient water.

An important fact for the orchid-grower of this region to keep in mind is that watering methods must be flexible enough to allow for our changing seasons. They will need to be altered considerably as we move from summer into fall—on into winter and then spring. Late fall and early spring are the two danger periods for possible over-watering. Prolonged periods of wet, cool, cloudy weather, interspaced with days of bright, warm sunshine, can create a problem. During such times, if both house and plants are kept "more to the dry side," there will be no cause for concern. The weather cycle soon moves on into either winter or summer, and our day-to-day problems are then more uniform. In winter the use of water for the plants and their growing area should be curtailed considerably. Syringing the foliage, and "throwing" water through the air in the houses in an effort to lower temperature will be unnecessary. While we still prefer keeping the potting medium moist in the winter, it will take much less water to do the job. Wetting the walks, floors, and the space between the pots on benches, in an effort to add sufficient moisture to the air, will be one of the major

winter watering tasks. This chore should be done early enough in the day to allow the houses to dry out thoroughly before the ventilators are closed.

The period from the first of December until the last of February should find the greenhouse glass washed clear of all shading. Only in this way can the plants receive full benefit from the amount of winter light available. Direct sunlight is needed at this time of year, not only because of its warmth and drying effects, but also to keep the processes of plant growth functioning properly. Plants must be exposed to full sunlight gradually. If they are to receive the essential amount of sunlight in winter, the grower must remember to take one precaution weeks in advance of the winter season. He should remove some of the shading in early fall, either by washing it considerably lighter or, better still, by removing it in ¾-inch strips at 4- to 6-inch intervals. The plants are then exposed to more light by degrees, and by December they have acclimated themselves to the full sunlight. If the shading is maintained until December and then removed in one operation the change will be too sudden and severe for the plants.

There is no need to be further concerned about improving any of his culture methods if the grower has unknowingly forfeited his chances of success by slipshod potting. "Over-watering" and "to much water" are reasons often given for failures when, actually, they were due to other circumstances more difficult to recognize. Quoting from our earlier "Cultural Notes" in the *American Orchid Society Bulletin* (1953), the grower should consider:

> "In relation to watering, the condition and texture of the potting medium are very important. When the medium is too loose and placed in the pot in a haphazard manner, heavy watering soon breaks it down into a soggy mass. On the other hand, when the medium is packed so firmly that on becoming wet it forms a solid mass, water cannot drain away quickly. Either condition prevents proper aeration at the roots and consequently is conducive to root decay. Overwatering is blamed for losses of that kind when actually an inferior potting job is the true culprit.
>
> "There are three rules of potting technique which are particularly important here in the middlewest where heavy watering is necessary. First, the osmuda fiber used must be placed in such a way as to insure fast drainage. Second, the medium holding the repotted plant should be firm, but solid; spongy, but not soft. Third, every care must be taken that plants are not over-potted. Repotting plants with these three basic rules in mind leaves each grower with plenty of margin to employ his own pet tricks and personal ideas in the operation. As long as the ideal goal is reached, the exact methods of approach may vary with the individual's preference. However, the ideal goal is always the same—a potting medium which is of proper amount and consistency to afford the best possible drainage and aeration.
>
> "The degree of firmness of the osmuda fiber usually is a major concern to beginners. To get the pieces of material fitted firmly into the pot with the fibers in an upright position is difficult for some. Perhaps that is because during the potting process it is so easy to allow the layers of fiber to become folded over or beaten down into one another. One way of easing this difficulty is to cut the osmundine so that the fibers run vertically in pieces about 3 or 4 inches in length. Chunks this size are long enough to be bent in half with both fibrous ends turned upward when inserted

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Dividing and repotting a Cattleya plant (see opposite page).

into the pot. Working at this stage with nothing but the hands—no potting tool—each succeeding piece of fiber is folded and tightly inserted along side the preceding one until a firm layer is fitted in. Then, by inserting a potting tool into the folds of fiber, this entire layer can be shoved down tightly into the pot. For some, a tamping action will move the mass of fiber into position more easily. The one thing to guard against is a heavy pounding action, which will beat the fiber into an impenetrable solid. If, in the first step, the pieces of osmunda are compressed firmly together, and then pushed or tamped into place, the tapering sides of the pot will lock each layer together as a mass.

"If the layer of fiber was quite firmly locked together before it was shoved on down into the pot, it should now be very firm, yet still spongy. That is the consistency to be desired. The number of layers will, of course, be governed by the size of the pot. Usually, three layers are required to install a mature Cattleya in a five-inch pot. After a little practice in fitting the pieces together, the individual soon learns to recognize just how tightly each layer should be placed.

"Because it is most important that the surface remain firm, yet open enough to allow water and new roots to penetrate easily, this potting method works especially well for the top layer of the medium. When the potting job is finished, the surface should be trimmed only enough to cut off the long straggling ends of fiber. By no means should it be sheared down to a hard, smooth face. Like most human beings, orchid roots have the inclination to take the course of least resistance. If the medium is too hard for them to enter readily, the roots will either crawl over the surface and down the outside of the pot, or grow along the surface for a few inches and eventually come to a stand-still because of insufficient moisture.

"The type of osmundine used in the layer directly over the drainage crock is especially important to the way a plant drains. Be sure neither you nor anyone potting your plants ever uses soft, dirt-filled fiber in the bottom of the pots.

"When it is desirable to save the back-bulb portion of a Cattleya plant which is being repotted, there are several ways of accomplishing the task. Because of the method used here, we have found a carpenter's key-hole saw, with its blade shortened to about half the original length, is an indispensable tool. As can be seen in Fig. 1 [see page 162], the saw is shown as it is being inserted into the potting medium at the point decided upon for division. The rhizome can now be severed easily; the potting medium along with its mass of roots, is cut through from one side of the pot to the other. As can be noted in this particular case, the division produced a four-bulb front section to be lifted out, and a three-bulb back section to be left intact in the pot. Fig. 2 shows the plant with the division completed.

"In Fig. 3, photographed along side of the pot for comparison, is the front section of the plant trimmed and prepared for repotting. The piece of pot rim, which has been tied on, is to protect the emerging root tips. These tips can be seen clearly in Fig. 1 as they rest on the original pot rim. Giving them another piece of rim on which to rest is the easiest way to protect them from being broken as new osmunda fiber is packed around the plant in repotting. Careful protection of that small inconspicuous cluster of new roots is insuring the plant becoming quickly and safely established in its new pot. As can be observed in the photographs, this is doubly important in the case shown here because the new growth is in sheath and will flower in the not too distant future.

"Figure 3 also shows the back-bulb section of the plant after it has been re-worked and is ready to be returned to the growing area where it will be handled just as another established plant. The cavity left by the removed section has been filled—partly with fresh osmunda fiber and partly with broken crock. Obviously, the plant will no longer make growth in the area around the rhizome stump; consequently, it is that area which receives the crock. In the same manner as if one were repotting a plant, osmunda fiber is fitted into the part of the cavity which will support the new growths. Besides conserving on osmundine, this using of part fiber and part crock keeps the amount of potting medium in proportion to the size of the remaining plant. Occasionally, during the first year, a back-bulb section handled in this manner will out-perform the front half of the original plant. Fig. 4 shows how such a section left undisturbed in this manner last summer has developed and produced four large flowers within a year.

"While this speed of development will not always occur in one year's time, the first new growths will almost invariably be strong enough to reestablish the plant to the point where it will flower on the second growth.

"This method of back-bulb propagation has proven advantageous, we believe, for two reasons. When the actively growing front end is taken away without disturbing the root area of the older section, there will, in most instances, be enough life left somewhere in some of the old dormant roots to produce new short lateral ones. Even when new roots do not develop and the potting medium is left undisturbed and kept constantly moist, the back-bulbs appear to get enough moisture, possibly through osmotic action, to stay in good shape and produce a worthwhile first growth."

Phalaenopsis Luedemanniana, with plantlets from spent flower spikes.

In some of the orchid genera there are certain species which can be easily propagated in another manner. These species produce new divisions or adventitious growths as part of their normal growing habit. In this group there are two types of plants—one which produces adventitious growths from the old flower spikes, the other which produces its new divisions, or plantlets, from the matured, old canes.

Phalaenopsis Luedemanniana is the best example of the type of orchid plant which produces adventitious growths from spent flower spikes. If, after flowering, the old spikes are left on the plant, small plantlets will appear from nodes on the ripening "wood." These little plants develop quite rapidly and will need to be either removed early or left on the old spike and pinned down to thepotting medium of the parent plant.

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1. This plant of *L.C.* "Rosamunde" ("Brittania" × "Sargon"), with its root growth starting, would be in an ideal stage to repot if it were not for the buds developing in the sheath. Rather than disturb it at this time, it will be handled as illustrated in figs. 2–4.

2. A chunk of solid medium-grained osmunda fiber is cut to fit beneath the new growth. Two lengths of light-weight galvanized wire are bent on one end to clip over the rim of the pot, and then bent at right angles at the other end to fit over the osmunda pad. The wire on the left side is shown clamped in place; that on the right side is supported against the pot merely to show the pattern.

3. The osmunda fiber is placed in the wire "cradle" and firmly held in position by wires bent in a "square U" fashion.

4. The root system of the plant handled last season has now grown through the added fiber. This season, the plant had just finished flowering as the new roots started to move through the osmunda fiber. The plant can now be repotted without a serious set-back.

Dendrobium Thwaitesiae var. *Veitchii*, with adventitious growths from canes of previous year.

Dendrobium nobile is typical of the type of orchid which produces adventitious growths from the old mature canes of previous years' growths. The grower should let these initial growths develop for the first year on the parent plant. When the second growth is about one inch in length, the small individual plants can be cut from the old canes and reestablished in individual small pots.

TOMORROW

Every task that is performed today in the caring for orchids is done with eyes and hopes set toward tomorrow. Every flower and every plant of tomorrow is a product of today or some yesterday. Actually, the whole relationship between past, present, and future of orchids at the Garden is so closely interwoven that it is impossible to draw a definite line where one era ends and the other begins.

It is a foregone conclusion that future orchids at the Missouri Botanical Garden will continue to hold, and to improve upon, the high esteem that has been theirs in the past. There is virtually no end to the things yet to be learned about and enjoyed from this large and increasingly popular family of plants. Remaining yet to be done is a great deal of study on effects of artificial light on growth and development as well as flowering. It may become possible in our midwestern climate, as indications show it may in more suitable locations, to develop orchids from flask to flower in 2½ to 3½ years. Should this happen, the Garden, much sooner than has been expected, would be able to take advantage of some of its outstanding potentialities for hybridizing.

New advances in materials, equipment, plant foods, etc., open many possibilities for improving growth and growing conditions for orchids. Problems involving better air circulation and the addition of more moisture to the air are but two examples of subjects for further experiments. The use of fiber glass or plastic panels to replace glass in the construction of greenhouses offers a large and comparatively new field for contemplation and research. Even changing the structural design of greenhouses has interesting possibilities.

Of course, one of the largest and most intriguing subjects connected with orchids of the future is breeding and hybridizing. For a non-commercial institution such as the Garden, interested chiefly in acquiring knowledge of plants, perhaps no better program could be instigated than that of developing superior strains of species which would breed true to the variety. There is a lamentable need for such plants. Although hybridizing has been moving along at a furious pace for the past twenty years, orchid hybridists realize that there has always been a vulnerable spot in the foundation of the program. The use of superior plants for parents has not always resulted in superior progeny, because these excellent varieties, as often as not, do not breed true. Few commercial firms are prepared to lend the time and space involved in working through a program of several generations of inbreeding which would be required to develop such plants. However, the orchid range which finally introduces these much-needed stabilized superior

varieties of species for stud plants will be performing a very great service to the future of orchids.

There is another much-needed breeding program which could be a boon to the future of certain yellow types of Cattleya and Laeliocattleya hybrids. This would involve remaking the primary cross, *C. Iris (Cattleya bicolor* × *Cattleya Dowiana)* to serve as a foundation for the reconstruction of the entire family of yellow, spade-lip type hybrids.

When the original *C. Iris* was produced in the late 1890's, evidently the particular plants of *C. bicolor* or *C. Dowiana* used were either not compatible, or one or the other parent had a certain recessive fault which became apparent in the hybrid. In *C. Iris* some factor exists which produces flowers with unbalanced petals and blister-like distortions. Evidently, hybridists disregarded the malformation in this early cross, and used *C. Iris* as a parent in producing many of our modern spade-lip type yellow and bronze hybrids. Sometimes *C. Iris* appears as often as four or five times in the parentage of some of these crosses; and this same deformity, in varied degrees, is in evidence. It would seem that the only solution to eliminating this crippling influence from future Cattleya and Laeliocattleya hybrids of this group, would be to remake *C. Iris* from selected superior varieties of *C. bicolor* and *C. Dowiana*.

The possibilities for the great number, the variety, and the breath-taking beauty in future orchids are almost staggering to the imagination. All of these possibilities will never be explored, of course, mainly because hybridists must be practical, at least to a point, in the creation of new blooms. For instance, it does not seem wise to develop great numbers of orchids, no matter how gorgeous, if they bloom when there is little demand for that particular type of flower. Neither is it practical to develop lovely blooms which possess poor "keeping" quality. Perhaps, however, an institution such as the Garden could be more justified than commercial firms for creating orchids only for beauty or botanical value.

At present, there seems to be a growing demand for hybrid Cattleya flowers which are smaller, flatter, and of superior texture—"cocktail orchids," some florists call them. They would help to bridge the gap between the flamboyant types and the smaller less conspicuous sprays. The Garden has a number of fine old primary hybrids and superior varieties of species in its Cattleya collection which could serve exceptionally well as progenitors in developing a new class of smaller but superior flowers. *Cattleya* "Portia" var. *gloriosa, C. Bowringiana* var. *splendens,* and *C. O'Brieniana* var. *alba* are three of the most outstanding of these. All of these plants have exquisitely formed flowers with symmetrically full and quite flat petals. Both in size and appearance, these blooms resemble excellently shaped flowers of Phalae-

nopsis rather than those of conventional Cattleyas. The rich glowing colors of *C.* "Portia" var. *gloriosa* and *C. Bowringiana* var. *splendens* are equalled in quality by the marvelously firm texture of the waxy, all-white *C. O'Brienniana* var. *alba.* The Garden is indeed fortunate to have these rare and remarkable plants. If they can be made to breed true, surely their offspring will some day make orchid history.

For many years, the orchid collection of the Missouri Botanical Garden has been a sort of living orchid file—a plant index where any one at all interested in orchids could see the rare botanicals as well as modern hybrids which they read about. In fact, the Garden is one of the few places in the country having such a large and representative collection of orchids which is open daily to the public at no charge. Let us hope that no future day will bring a necessity to change that policy. Also, let us hope that the Garden may continue to acquire and contribute knowledge concerning this very worthy family of plants which is just now at the threshold of a new prominence in the modern plan for every-day living.

Cattleya Trianae var. "D. S. Brown."

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden carries on the garden established by Henry Shaw over a century ago at "Tower Grove," his country home. It is a private institution with no public support from city or state. The old stone walls and cast-iron fences, the Linnean House, the Museum, the Mausoleum and the "Old Residence" all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's Day and Christmas) from 9:00 a. m. until 7:00 p. m., April to November, and until 6:00 p. m., November to April, though the greenhouses close at 5:00 p. m. Tower Grove, itself, Mr. Shaw's old residence, is open from 1 until 4. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., opposite the junction of routes 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

THE MISSOURI BOTANICAL GARDEN

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A TOUR
OF
SHAW'S GARDEN

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SHAW'S GARDEN IN 1876

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A TOUR OF SHAW'S GARDEN

Many visitors ask us, "Which is the best way to see the Garden?" So we have planned a trip of less than an hour which will let you see those places which visitors enjoy the most. This trip is leisurely and you will have time to stop to study the flowers, enjoy the pleasant views, read the labels, and note which plants you would like to try in your own garden. But an hour is far too short a time in which to see more than a fraction of one of the world's best botanical gardens, so we hope you will return again and again.

Over the MAIN ENTRANCE, at Tower Grove Avenue and Flora Boulevard, you can see a stone, carved with Henry Shaw's choice of a name for the Garden, "Missouri Botanical Garden, 1858." But even today, more than 65 years after Shaw's death, St. Louisians and many others still call this place "Shaw's Garden" in memory of the man who bought the land and planned and built the Garden as a country home. Long before his death, at his house in the Garden, Shaw had given nearby Tower Grove Park to the city. In his will, he left most of his wealth in a trust to support his Garden so it could be enjoyed by all the people. Most of the money for maintaining it still comes from Henry Shaw's estate, but a constantly increasing number of people are helping to support the Garden by means of contributions and bequests.

Directly ahead, as you enter the Garden, are the WATER-LILY POOLS. Here, from late July until frost, may be seen some of the finest tropical water-lilies ever grown. Many beautiful varieties, like the pure white "Missouri" which was developed at the Garden, bloom at night but are usually open in the early morning, in late afternoon, or on cloudy days. The best of the varieties are the day-blooming tropical hybrids. Nearly all of the ones to be seen in the Garden were developed by the superintendent and one of the first he produced, the white variety, "Mrs. G. H. Pring," is named for his wife. By using a wild African yellow

TROPICAL WATER-LILY POOLS

water-lily, Mr. Pring was able to develop several excellent new yellow-flowered plants. "African Gold" was one of the earliest ones and is still one of the yellowest, but some of the recent hybrids which originated at the Garden have much larger flowers. The giant water-platter, or Victoria water-lily, from the Amazon region of South America is grown in the central pool. The leaves have upturned margins and are supported by such strong ribs on the under sides that some of them can bear the weight of a small child.

The beds bordering the lily pools are usually planted with tulips in the spring and with ornamental foliage plants in the late summer. One oddity is a variegated-leaved form of cassava, a South American plant which is best known in this country as the source of tapioca. If you now walk to the north (to your right as you entered the gate), you will pass a row of old hawthorn trees and young flowering crabapples which are covered with bloom in the spring. The ROSE GARDEN you enter is especially interesting to St. Louis gardeners because here rose varieties sent in by nurseries and growers from all over the country are tested. One may see which roses do best in our climate when grown under conditions very much like those in the average home garden. The roses

NYMPHAEA "DIRECTOR GEORGE T. MOORE"

THE ROSE GARDEN

are at their prime in June, but many of them have some flowers throughout the summer and most kinds have a second burst of bloom in September.

Beyond the Rose Garden is the LINNEAN HOUSE, the only greenhouse Mr. Shaw built which is still in use. Along a ledge in front of the Linnean House is a hedge of Korean boxwood. This grows quite well in our climate and persists when many of the English varieties die from cold, drought, windburn, or hot summers. Even better for St. Louis gardens are some Serbian varieties of boxwood. The Garden has introduced several of these but they are still too scarce to be available from most nurserymen. You can see some plants in the Mausoleum grounds later on in your tour. Above the doorway of the Linnean House are busts of Linnaeus, the great Swedish botanist, and of two famous American botanists, Nuttall and Gray. The ornamental brick-

A fine permanent planting of yuccas in the Linnean Garden

work and the relatively small area of glass are typical of greenhouses built before 1881. Within the Linnean House is a collection of camellias and other winter-flowering shrubs, most of them in bloom from January to March. The most attractive part of the interior is the rear wall, almost completely covered with an evergreen creeping tropical fig.

The LINNEAN GARDEN surrounding the Linnean House has been designed to produce a succession of bloom through the year with a minimum of labor. Here you will find many of the old and new varieties of spring-flowering bulbs, iris, peonies, day-lilies, African lilies, hardy chrysanthemums, and many other perennials. In July the tall stalks of waxy white yucca flowers make a nice contrast to the dark red brick of the old greenhouse.

You can leave the Linnean Garden through an archway in the old limestone wall. Just before you pass through the archway, notice the pair of boxwoods and the pair of southern magnolias, or bull bay trees. The southern magnolia is not completely hardy in our climate unless it is in a protected place, but the plant is worth effort and worry because the large leaves are green and attractive throughout the entire year. To your right, after you pass through the gate, you can see a large river birch, a native of stream-sides of eastern Missouri and an attractive tree, especially when young. The driveway crossing this path leads to a work

A CHRYSANTHEMUM SHOW IN THE FLORAL DISPLAY HOUSE

area which is not open to visitors. In this area are some facilities for growing plants to be displayed indoors and outdoors, storage houses, the many workshops needed for a large botanical garden, and the heating-plant.

After you cross the road, you will see a large pin oak to your left. Pin oaks do very well in St. Louis. They have a pleasing shape, grow quite slowly, their leaves turn in the fall and many of them hang on the branches in winter. All the trees along the wall on the Tower Grove Avenue side of the Garden are pin oaks. To the right of the curving stone walk which leads to the Floral Display House is one of the many sweet gum trees in the Garden. It is easy to recognize by the star-shaped leaves and the fruits which look like Christmas-tree ornaments. Most of the plants in the Garden are labeled, and Boy Scout troops, garden

VANILLA ORCHID FLOWERS

Cryptanthus zonatus

clubs, and school classes can often be seen, notebooks in hand, identifying and studying the plants in the collections.

In the FLORAL DISPLAY HOUSE exhibits and flower shows can be seen from November to April. In November there is the Chrysanthemum Show; in December, the Poinsettia; in February, a magnificent display of orchids; and in March and April spring-flowering plants. Besides these Garden exhibits, there are the special shows of many plant societies such as the St. Louis Horticultural, The Cactus, Gladiolus, Iris, Dahlia, Rose, and Orchid societies. Bordering the inside of the Display House are tropical trees, most conspicuous of which is the fiddle-leaf fig. Small plants of this are often grown in homes because the large leathery shiny leaves fit into modern decorating schemes.

Connected to the Display House and down a small flight of steps is a greenhouse filled with plants which like a warm and wet habitat. Here, amid large-leaved philodendrons, exotic shrubs of the tropics, and bird-of-paradise plants, are to be seen a few specimens of the Garden's large collection of orchids and rare bromeliads.

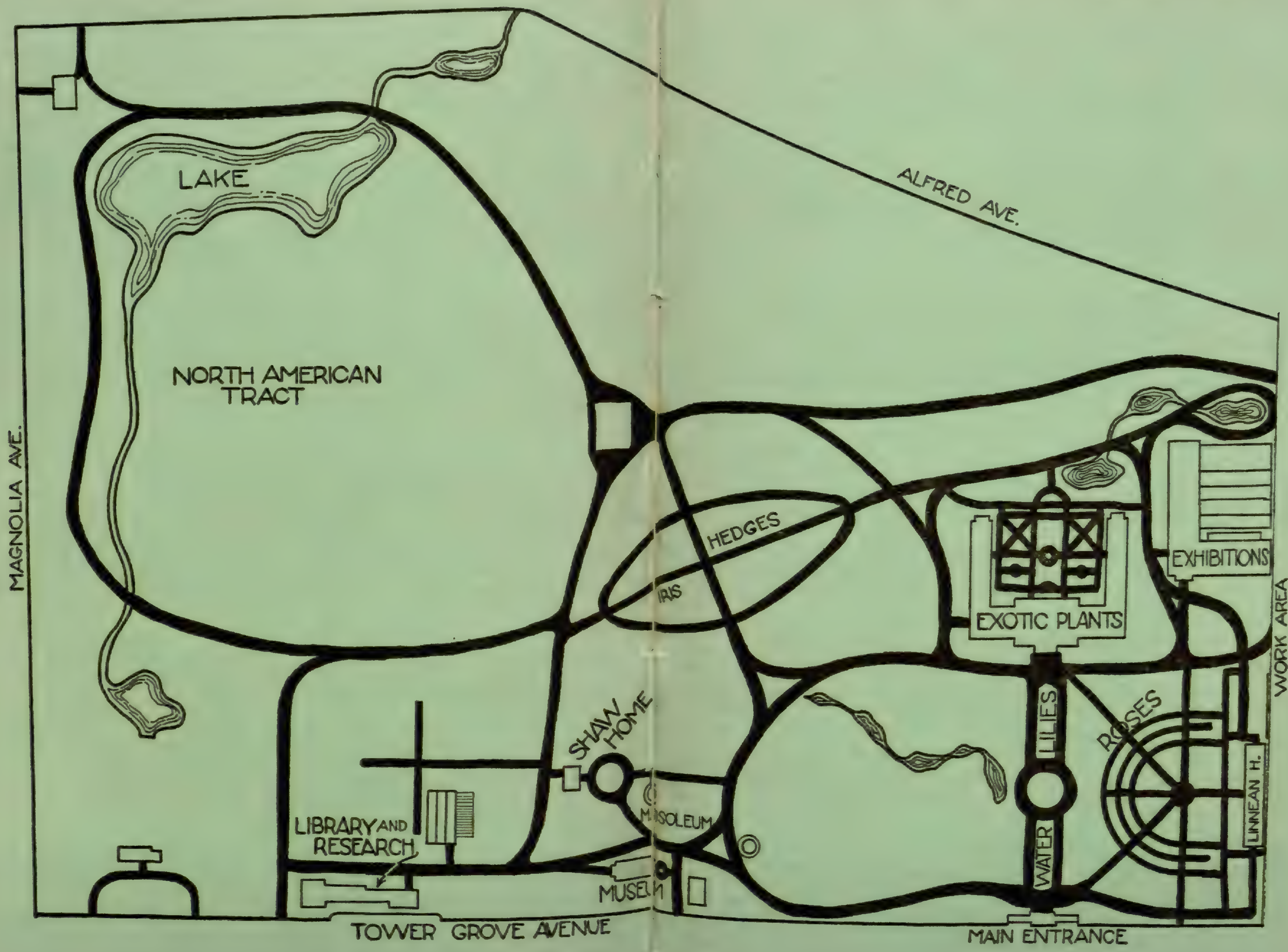
The orchid collection was started in Shaw's time and gradually grew until now there are more than 50,000 plants, most of them grown at the Garden's Arboretum at Gray Summit, Missouri, about 35 miles west of St. Louis at the junction of Highways 66 and 50. Included in the collection are a large number of wild orchids which were either given by

orchid fanciers, gathered in the tropics by members of the Garden staff, or purchased from orchid collectors and growers in many parts of the world. Since 1927 the Garden has bred orchids and produced many hybrids. Some of them, such as the deep purple varieties, "Director G. T. Moore" and "Washington Centennial," are far more beautiful than the commonly seen corsage orchids. Each fall the Garden selects over 300 of its best orchids for the bouquet carried by the Veiled Prophet's Queen at the outstanding social event in St. Louis, the Veiled Prophet's Ball. A beautiful yellow orchid is named "Mimi Koehler" in honor of the queen who first carried it in her bouquet.

To some plant fanciers, the bromeliads, a group of plants to which the pineapple and Spanish moss belong, are even more attractive than orchids. They usually grow in trees or on rocks and require little soil. The scaly leaves of the bromeliads retain moisture, and in many of them the leaves form a funnel-shaped receptacle which holds water, hence the popular name "tank plant." Besides the plants shown in this tropical house, others are grown on the ground and on the trunks of trees in the Palm House.

Leaving the Display House by the south door, you pass between a large boxelder (on your left) and a butterfly-bush (on your right), and turn right. At the south of the walk the pagoda tree, or scholar tree, from China, greets you. It has beautiful feathery leaves, and in late summer long clusters of creamy-white flowers hang from the branches. A few feet beyond a large purple beech, turn to your left and walk up the steps toward the pergola. Beside the walk are several of the very low, bronze-leaved Andorra junipers and the taller, blue-green Pfitzer junipers. Both of these trees are good for planting in the St. Louis region and, once established, grow well even through dry, hot summers and cold, snowless winters.

From the wisteria-covered pergola you can look over the ITALIAN GARDEN, a geometrical arrangement of flower beds centered about a statue of Juno which Mr. Shaw imported from Italy. Formal European gardens often use boxwood for hedges, which has the advantage of keeping its leaves throughout the year, but in our climate California privet is easier to grow and looks well if it is kept carefully trimmed. Within the enclosure are many kinds of plants with attractive foliage—santolinas (or lavender-cotton), lamb's ears, bloodleaf (or iresine), alternanthera, variegated-leaved jatrophas, croton and coleus. Pandanus plants are grown in pots as accents while the whole Italian Garden is surrounded by rows of different kinds of cannas. The Italian Garden is especially beautiful from July to the time of heavy frost.


ALFRED AVE.
LAKE
NORTH AMERICAN TRACT
MAGNOLIA AVE.
HEDGES
IRIS
EXHIBITIONS
EXOTIC PLANTS
WORK AREA
SHAW HOME
LILIES
ROSES
LINNEAN H.
WATER
LIBRARY AND RESEARCH
MUSEUM
TOWER GROVE AVENUE
MAIN ENTRANCE

As you enter the greenhouses from the left you see banana plants, some of which are usually bearing bunches of fruit, and coffee bushes. Several kinds of hibiscus are usually in flower in this same end of the greenhouse and strengthen the impression of a tropical farm, for hibiscus is often planted as a hedge around the gardens of coffee plantations. The coffee bushes frequently have flowers, green berries or ripe red berries, but seldom as many as grow on bushes in the tropics. Most of this greenhouse is filled with succulent plants from Africa. Nearly every one knows the common house plant called "mother-in-law's tongue", "bowstring hemp", or "sansevieria", but not many know that there are about one hundred other kinds of sansevierias which are native to Africa. Many of the kinds shown in the greenhouse are frequently grown in pots in the home. Since they are natives of the desert, sansevierias stand the dry winter heat of modern homes and sometimes live even when watering has been neglected for several weeks. Another plant easy to grow in the home is the wax plant, or hoya, a vine with thick, shiny leaves. Its clusters of waxy flowers resemble those of our native milkweed, as they should, because the two plants belong to the same family. Like our milkweed, the wax plant has a milky juice.

Up a few steps is the FERN AND CYCAD HOUSE. Here are many kinds of ferns even though it is difficult to keep them growing in dry smoky city air. Several specimens of an Hawaiian tree fern grow well here and increase rapidly in height and in number of lacy fronds. Most striking are the many kinds of cycads. Cycads look very much like palms but they are far more primitive. Botanists consider them a sort of connecting link between ferns and flowering plants. The kinds alive in the world today are few in comparison to the number which flourished long ago and which we know now only as fossils. One of the cycads in this greenhouse, the sago plant, comes from western Asia. There it is frequently cut down to harvest the starch which is stored in its trunk. Its palm-like leaves are dried, dyed, and shipped to this country for use in wreaths and similar decorations.

Beside the grotto are several large-leaved breadfruit vines or monsteras. The true breadfruit is a large Asiatic tree, the fruit of which is an important food for many people in Asia and the islands of the Pacific. The New World breadfruit is a vine, and is eaten in only a few places in Central and South America. The fruits of both plants are greenish when ripe and, like the pineapple, are composed of many small fruits, the size of which can be judged by the markings on the composite fruits. The breadfruit belongs to the aroid family to which also belong the many philodendrons, the Jack-in-the-pulpit, skunk cabbage, and

THE ITALIAN GARDEN

VIEW IN THE DESERT HOUSE

calla lily. In the vestibule at the entrance to the Palm House you will find two sign panels that will direct you to many of the kinds of aroids commonly grown in homes and greenhouses.

In warm regions the several thousand kinds of palms provide food and fuel, thatch and wood for building, and sugar and oil which can be sold to buy clothing and luxuries. In the PALM HOUSE are several date

palms, the African oil palm, and the sugar palm. The California sentinel palm grows so tall that it sometimes threatens to push out the roof and must be removed. Familiar to Florida visitors is the palmetto, with fan shaped leaves. It is sometimes cut down to obtain its heart, called "palm cabbage", which is eaten cooked or in salads. Climbing up the palms are tropical vines, bromeliads, and several kinds of orchids including the vanilla plant, one of the few vine orchids, which in season bears flowers or vanilla "beans". African violets, relatives of the spiderworts, more bromeliads, and other plants which like moist shady places grow on the ground. From the west porch there is an excellent view of the Italian Garden, while the east porch faces the water-lily pools and the main entrance.

Continue on south through the Palm House to the ECONOMIC HOUSE where many tropical trees and shrubs grow. Here you will find young specimens of trees which give us rubber, chewing gum, kapok, and mahogany, as well as trees which are not so well known.

At the end of this house a flight of steps leads down into the DESERT HOUSE. From the steps you can see the great diversity of plants native to the deserts of the Americas. The spurges which are so prominent in the African Desert House are not common here, although there are a few such as the poinsettia and candle wax plant from Mexico. Cacti dominate the American desert scene. There are about 2000 kinds, ranging from miniature pebble-like plants to many-branched giants larger than the saguaro of the Southwest. The pereskia, one of the few cacti with ordinary leaves and which is often grown as a hedge in the tropics, may be seen at the left of the stairs. The fruit of most cacti is edible, and that of the flat-pad opuntias is the best. Called "tuna", it is sometimes sold in large markets, especially in Italian and Greek neighborhoods, for New World cacti have been cultivated in the Mediterranean region for a long time. Many cacti have beautiful flowers. The Christmas cactus, easily grown in the home, bears rose-red flowers about Christmas time. Some cacti, such as the night-blooming cereus, flower at night, and by the time the greenhouses open the petals have closed.

Notice that most of the plants have waxy coverings to prevent evaporation of their stored water, and nearly all have spines to protect them from animals which try to eat the plants for their moisture. The spines on the barrel cactus protect it from animals but not from the knives of man. Many a thirsty wanderer in our deserts has been saved by the water contained in a barrel cactus. Even the desert barberries have spines on their leaves, although animals are free to carry the unprotected berries and thus spread the seeds.

Demonstration plot of barberry hedges in Economic Garden

The yuccas and agaves are not cacti, but relatives of the lily and the amaryllis. Most yuccas and many agaves flower every year, but some agaves flower only when they are mature and then die. The century plant, an agave, gets its name from the belief that it flowers only when it is a century old, but actually it may flower when it is as young as ten years old. Several important Mexican products such as the alcoholic beverages, *pulque* and *mescal,* and the fibers, *sisal* and *henequen,* are obtained from agaves.

You can leave the Desert House by the north door and pass through a corner of the Italian Garden to reach a gravel path bordered by Osage orange trees. On your way to the Economic Garden you walk by several Chinese spindle trees and further on the closely related ground cover, the winterberry euonymus. The ECONOMIC GARDEN is a series of terraces on which plants are tried out for use in this climate. The entire area is surrounded by a trellis covered with climbing roses. Of interest to nearly all home-owners is the demonstration plot of hedges. Oriental arborvitae, boxwood, yew, shingle oak, dwarf maple, Siberian elm, privets, some of the many barberries, ninebark and burning-bush have been maintained for several years in an effort to learn which hedges are suitable for St. Louis. Over the central path arch espaliered apple trees. These trees yield very few apples in our climate but this system of training the branches is useful in locations with cool summers and little sun. Many of the newer iris, as well as some old and good varieties, bloom in the Economic Garden each spring.

AN AZALEA PLANTING WEST OF THE MAUSOLEUM GROVE

When you reach the row of white birch at the center of the Economic Garden, turn to your left. You will soon see a Chinese pistachio tree and the silk-tree from southeastern Asia. Off to your right is an oddly branched ginkgo tree, one of the many which were planted when the Garden was young.

The path passes between two of the most perfectly shaped holly trees in the Garden. Holly berries turn red in late November and stay on the trees until early spring when birds eat them. Not all the trees bear berries because some are male and bear the pollen which is needed by the female tree to set fruit. There are several clumps of azaleas at the junction of the paths. Azaleas are becoming popular in St. Louis because gardeners have learned to keep the soil acid, and the beautiful new varieties are now being successfully grown.

Probably the most beautiful view in the Garden is from the north entrance to the Mausoleum in April, when azaleas are in bloom and the flowering crabapple trees on the knolls are solid masses of color. Over the grassy meadow you can see the old Linnean House and off to one side are several redbud trees, both the usual pink and the rare white-flowered forms. The white limestone pillars and black iron fence of the Mausoleum make a good frame for this springtime composition.

The MAUSOLEUM grounds are green through the year. Besides well-known evergreens such as the junipers and yews, there are many other plants which do not shed their leaves. Evergreen barberries, mahonia, boxwood, pieris, with its lily-of-the-valley-like flowers, and the small-leaved Japanese holly are planted about the gates. Part of the ground under the shade of the old trees is covered by euonymus, but the most striking ground cover is an ivy, "MBG Bulgaria", which grows better in shaded places in St. Louis than any other variety. It not only covers the ground but climbs over the trunks of trees and out the branches. Mr. Shaw is buried in a structure designed by an important St. Louis architect of his time, George Barnett. The tomb figure was done by Ferdinand Miller of Munich, several years before Shaw's death.

When Mr. Shaw acquired the land the Garden now occupies, there were scarcely any trees except a clump of sassafras which still persists at the south end of the Mausoleum grounds. Because of these trees and the tower on his house, built in 1849, he named his country home "Tower Grove". Mr. Shaw's country house is kept as much like it was in his time as is possible. Most of the furniture belonged to him, and the pieces which did not are largely from houses of prominent St. Louis families of his period. Members of clubs belonging to the Missouri

BULGARIAN IVY IN THE MAUSOLEUM GROVE

Federation of Women's Clubs serve as hostesses from 1 to 4 p. m. daily. The house is maintained by contributions and through the sale of publications of interest to visitors.

As you leave Mr. Shaw's country home you will walk under the arching branches of an American elm tree. This tree was grown from seed taken from the "Daniel Boone Judgement Tree" under which Daniel Boone held his court in the years just before Mr. Shaw arrived in St. Louis. To the south you can see the building which contains the administrative offices, the library, and herbarium (dried plant collections). The north end of this building was Mr. Shaw's town house, erected in 1859 at Seventh and Locust Streets, and moved to its present site in 1891. The library and botanical collections are among the best in the world and are used by the staff and research workers.

In 1859 Mr. Shaw built a "Museum and Library" modeled after the

"TOWER GROVE," HENRY SHAW'S COUNTRY HOME

one he saw at Kew Gardens in London. This still serves as a research center and a meeting place for gardening and botanical groups. Small exhibits are also sometimes staged there. This is probably the oldest museum west of the Mississippi River. Around the walls are portraits commissioned by Mr. Shaw of early botanists.

You can leave the Garden by the Cleveland Avenue entrance, in front of the Museum, or, passing a pavilion with a statue of the "Victory of Science Over Ignorance" erected by Mr. Shaw, follow along the old limestone wall to the main entrance.

THE MISSOURI BOTANICAL GARDEN

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OLD GREENHOUSE AT THE GARDEN IN THE 1870's

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden carries on the garden established by Henry Shaw over a century ago at "Tower Grove," his country home. It is a private institution with no public support from city or state. The old stone walls and cast-iron fences, the Linnean House, the Museum, the Mausoleum and the "Old Residence" all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's Day and Christmas) from 9:00 a. m. until 7:00 p. m., April to November, and until 6:00 p. m., November to April, though the greenhouses close at 5:00 p. m. Tower Grove, itself, Mr. Shaw's old residence, is open from 1 until 4. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., opposite the junction of routes 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

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COVER: Italy was represented in the St. Louis Garden Club's "Christmas Trees around the World" by a presepio or scene at the manger in Bethlehem. The first presepio is said to have been built by St. Francis of Assisi in 1223. The 400-year-old figures in the presepio of "Christmas around the World" are made of carved and painted wood and are richly dressed in costumes of the 17th and 18th centuries. A Della Robbia garland, made of laurel, oak, and pine leaves and accented with cones, acorns, and fruit, was an authentic frame for the manger scene. Photo by Charles Trefts.

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Missouri Botanical Garden Bulletin

Vol. XLII DECEMBER, 1954 No. 10

A CHRISTMAS TREE FARM NEAR ST. LOUIS

JAMES M. NELSON

There are many articles on Christmas tree planting but very few of them tell about efforts in the St. Louis region. We asked Mr. James Nelson to describe the methods he uses and the results he obtains on his 50-acre Christmas tree farm, just three miles up the Mississippi River from Alton and twenty-five miles from downtown St. Louis. The land is too hilly for farming, so Mr. Nelson decided to grow trees and to harvest them as four separate crops: as Christmas trees, as posts, later as pulpwood, and finally, after twenty or thirty years, as saw logs.

Our first tree order, from the State of Illinois Nursery, was for 2000 Virginia Pine, 1000 Pitch Pine, 1000 Jack Pine and 650 Multiflora Rose. The roses were to form a hedge along the edge of the bluff and furnish berries and cover for wildlife. The trees arrived in March, 1949, by rail express, in four bales wrapped in flat veneer mats tied around damp sphagnum moss, each bale weighing about forty pounds. They were promptly unpacked and heeled-in prior to planting. During the first two years a shovel was used to dig the holes in the contour furrows already plowed. An instructor in vocational agriculture at a neighboring high-school agreed to furnish half a dozen boys to assist in planting, and although they needed supervision they worked fairly well.

Through the crucial summer months of their first year away from the nursery the 1949 plantings achieved a 100 per cent survival rate. By autumn I was sufficiently encouraged to order not only a lot more young pines but 200 Tulip Poplars for a ravine and 500 *Rosa multiflora* plants for placing around the small natural pond in one of the several sink-holes so common to this general area. Because the project was, and still is, to a degree, experimental, the State's District Forester and I decided to order different species of pines. We settled on 9,000 Red Pine, 2,300 White Pine and 1,000 Shortleaf Pine, after assuring ourselves of the absence of Ribes (gooseberry or currant) from the area proposed for the White Pine, which is subject to a fungus disease known as White Pine Blister Rust if planted within 300–400 yards of those bushes. The fungus requires two alternate host plants, Ribes and White Pine, to complete its life cycle. Many local

areas and the entire region south of United States Highway 40 in Illinois are practically free from Ribes. We are close enough to the line of demarcation, although actually north of the highway, to be relatively safe.

For setting out the 12 thousand transplants and seedlings in March of 1950 we started with a crew of about fifteen boys, impressing on them constantly the necessity of keeping the young pine roots wet before planting and also of pressing the soil firmly around the roots to avoid air pockets. The small trees, 6–12 inches over all, were carried in clean old 5-gallon paint or grease buckets half full of water. We planted them four feet apart each way, and thus used 2,700 trees per acre that year. I discovered that fifteen lively young boys throwing mudballs at each other and admiring the river view on a warm sunny day did not accomplish as much as half that number working to keep warm, to get the task completed, and to get their wages, on a cold or rainy day. In fact, it was during one of our March snowstorms that six of us must have established some sort of record by planting five thousand trees in one day. But I'll remember *that* day for a long while—and so will the boys!

In March of 1951, 15,000 more young trees were planted, mostly Red and White Pines, with some Loblolly, Red Cedar, Bald Cypress, Black Walnut, Red Gum and Tulip Poplar either intermixed or placed in appropriate locations. For instance, the Loblolly were planted in alternate rows with the Shortleaf Pine, the Black Walnut on crests of hills, and the Tulip Poplar in the ravines, as recommended.

I had learned a more efficient method of planting from a visit with Forester Lane at the Shawnee National Forest in the southern extremity of Illinois. We discarded the old long-handled shovel in favor of a planting bar with a tapered wedge on one end, specially designed for the purpose. Instead of digging a hole and then filling it, we made a slit in the earth with the bar without removing any soil. After the roots were placed in the slit, a couple of firm foot stomps compacted the soil around the roots. The saving in time, trouble and expense was considerable. It now took only an eight-hour day for three men to set out one thousand seedlings. Other methods of planting forest trees employ the mattock or spade, the former being adapted to removal of sod. Most of our land is not sufficiently level to allow the use of tree-planting machines.

Competition of younger small pines with honeysuckle, blackberry, locust, sassafras, and weeds was not too serious the first two or three years. A scythe was used once or twice to cut the weeds in some places, and a wheelbarrow-type hand-sprayer with a 1/100 solution of *2,4,5,-T ester* and water proved successful for brambles, honeysuckle and younger locusts and sassafras. Larger locusts, which during the winter are cut to sell for fine fence

Seedlings are kept "heeled-in" in a furrow until planting time.

posts, are prevented from resprouting by covering the surface of the stumps with either *Ammate* crystals or painting with a solution of one quart of water to one or one-half pound of *Ammate*. For the more tenacious Osage Orange, its stump is saturated not only on top but on the sides with a 1/16 or 1/20 solution of *2,4,5,-T* and fuel oil or kerosene.

At least 90 per cent of the young pines have thrived with relatively little attention. Practically all of those planted during the three years before the disastrous droughts of 1952, 1953, and 1954 are doing fine, but the plantings of spruce and fir, obtained from a commercial nursery, and of Scotch, Red and White Pine, after 1951, have produced scarcely a tree. Because of the intense heat during the last three summers, we have lost almost every one of the ten thousand young pines, spruce and fir planted. The 30 thousand older pines, however, some of which (especially the Virginia Pines) have now reached a height of between ten and fifteen feet, will carry us over to more normal (?) productive years—we hope. Now we are using mostly the top six to eight feet of these taller trees because most people prefer that size.

Pine and spruce, unlike fir, may need some pruning to develop a dense merchantable form. We have so far not done much of this work because there has been little need to do so. Hand-pruners, lopping shears, and a rope-operated pruner on a six-foot pole are the tools used. The Red, White, and Scotch Pines do not have buds and small branches between the whorls (lateral

boughs) which mark successive years' growth. If a portion of the leader is cut off too late in the growing season, the remainder may die back to the whorl point in the fall or winter and the laterals will turn skyward to become leaders, forming thereby a less desirably shaped tree. If, however, the leaders and laterals of pine are cut off before a new terminal bud forms, in May or June for this area, there is enough of the growing season left to form a cluster of new buds at the ends of the shortened leaders and laterals. Unlike the spruce or fir, pines begin to grow tall by the third or fourth year after planting, especially the four-year-old (2–2) transplant stock. Here, height can increase by as much as two feet annually but such wide spacing between the laterals will naturally preclude development of a more compact and bushy tree. Early pruning can be important by the third or fourth year. Both a science and an art, it takes, after experience, but a deft movement for each tree.

Most of our pines so far have not had more than a satisfactory twelve or fifteen inches growth between laterals. On some of the faster-growing trees the leader is pruned at this point and the surrounding shoots, which are laterals of that year, are trimmed to eight or ten inches. New growth at the end of the laterals of previous years is treated in the same way. The most simple and successful rule for amateurs, such as we, to follow, is to shape the tree to a symmetrical cone.

We have done some experimentation with so-called stump culture. When our Virginia Pines are severed above live branch whorls, the uppermost remaining limbs, or newly developed adventiticus buds, usually form new leaders. Even more fascinating are the Pitch Pines, which sprout prolifically from a stump cut close to the ground with *nothing* left attached. Next spring, after allowing over one year's growth from the 1953 harvest, we plan to eliminate all but the most promising leader from those stumps which are still living and hope it grows into a satisfactory "turn-up" tree. Forester Fox, at Sinnissippi Forest in northern Illinois, told us he has produced some Christmas trees this way but that they are sometimes not so marketable as the original trees. Needless to say, the developed root system of such a stump tree is capable of producing growth in a shorter period than that needed for an original crop tree.

Christmas of 1953 was the first season we marketed trees. After dickering with several wholesalers in St. Louis Commission Row and with chain grocery stores, we decided to sell directly to the consumer here. About one mile from our tree farm is the highway, where we placed green and white signs. We also advertised in the local newspaper every day the two weeks before December 25th. The price was made deliberately lower than store

trees, and response was better than expected for our first year of selling a tree different from the traditional fir or spruce. Week-ends were so busy that we had to have two or three helpers, sometimes more, such as unsuspecting friends who came for what they thought would be a nice, relaxing afternoon far from the madding crowd.

People would get us out of bed at dawn, and get us out of bed at night. Children would become lost in the forest. Their parents would take an hour finding them and another hour selecting a tree unless we were blessed with cold winds, which made their selections less tedious, for us. Finnian, our oafish young Irish Setter pup, would infuriate our customers by jumping up on them with muddy paws. An indignant mother drove off in a huff because Sissy, our cat, had the audacity to scratch her eight-year-old son when he pulled her tail hard. We hastily took out liability insurance against the Great American Public tripping over Christmas tree stumps and breaking their necks. Come night, instead of accepting merrie olde Yuletide invitations from family and friends, we were too exhausted to do anything except to fall thankfully into bed. But our hard work and years of planning and perseverance had compensations, too, because an idea which had become a hobby was now a business, a growing concern.

City people liked to drive out in the country with the children to get some clean air, a fine view of the Mississippi, fresh trees which retained their needles for weeks, a large selection and—considerable savings in money. Country people were also even more aware of the advantages of home-grown produce over trees cut months before, kept in cold storage, shipped thousands of miles, and thrown around in bundles perhaps a dozen times before finally reaching their destination. A few potential customers *were* rather difficult, it is true, but most of them recognized a good buy when they saw it and one man even invited us aboard his yacht. Nor was our selling confined to the two hectic weeks before the Big Day in December. In April a woman telephoned to ask if she could buy a tree to celebrate a postponed Christmas with her wounded soldier son, due home from Korea. In September, the local Little Theatre needed a Christmas tree for a play they were about to present. In October, the Garden Club and City of Alton wanted bids for large orders of trees in the coming holiday season. Churches and schools placed orders weeks ahead of time.

Of the recently estimated 22 million domestic Christmas trees sold annually in this country, 97 per cent are represented by the eleven species of conifers listed below. Leading the list is the old faithful *Tannenbaum* or Balsam Fir, still preferred by some older conservatives, but in our opinion

not so attractive as some of the long-needle pines which furnish a refreshing version of a tradition perhaps four hundred years old or more:

Species	Number	Per cent
Balsam Fir	6,435,000	30
Douglas-Fir	5,830,500	27
Black Spruce	2,363,000	11
Eastern Red Cedar	2,128,545	10
White Spruce	990,200	5
Scotch Pine	806,925	4
"Southern" Pine	652,550	3
Red Spruce	594,160	3
Virginia Pine	370,000	2
White Fir	335,000	1
Norway Spruce	303,400	1
		97

States bordering Canada produce most of our Christmas trees. For instance, over half of the Douglas-Firs come from only two Montana counties. Nine out of ten trees come from private lands. In recent years one out of three Christmas trees distributed in our own country has been imported from Canada. Newfoundland, Nova Scotia, Labrador and the Dominican Republic have also shipped a few thousand trees to the United States, during the last ten years. Of 39 million families in the United States, according to the 1950 census, about one out of four apparently has no Christmas tree because only 30 million trees are distributed, including an estimated four million trees for decorating cities, schools, churches and other institutions. Although 43 per cent of Americans claim no religious affiliation it may be rather confusing to learn that only about one fourth of our families do without a Christmas tree.

A BOTANIST IN THE CHRISTMAS TREE MARKET

EDGAR ANDERSON

To the alert botanist the Christmas trees offered for sale in St. Louis for the last thirty years have formed an interesting pageant. Too far south for northern evergreens, too far north for southern evergreens, so close to the mid-continental plains and prairies that no evergreen is really happy here, St. Louis is the perfect vantage point from which to view the contest between the west coast and the east, between the long-needle pine swags of the south and the ground pine of the north.

Twenty-five years ago the North and East seemed to have the bulk of the Christmas tree business in St. Louis. There were northern White Pines with their soft needles in little bunches of five, and many Canada Balsams, their shiny dark green needles sticking out so clearly on either side of the

twig that they looked like nothing so much as a little boy whose mother had just parted his hair with a comb and sent him off to Sunday school. Ropes of northern Ground Pine were sometimes seen in the stores, and the farmers' markets had stickery Red Cedars from the near-by Ozarks. Even in those days, however, the West was not far away. If one went to Kansas City during the holidays he found the markets flooded with short-needled Black Hills Spruce to the virtual exclusion of eastern species.

Now it is all changed; western trees flood our markets, the exact species varying from year to year as different parts of our rich western flora are sampled by Santa Claus's business partners. Long ropes of Mountain Laurel foliage still come to our markets from the South and East. The big cones and the handsome young branches of our southern pines turn up here and there, but the bulk of our Christmas tree business is now with western species. These come from such a wide area, the species and varieties differ so much from one year to another, that it would be a very bold forester who would be willing to identify at sight all the trees he might find in any one St. Louis super-market. However, it is quite easy to classify all the Christmas trees as either spruces, firs or Douglas-Firs.

Were it not for the Douglas-Firs the cataloguing of Christmas trees would be simplicity indeed. Spruces and firs are very much alike; they are all shortish-needled evergreens with a stiff central axis and whorls of branches in almost mathematical perfection. There are many ways of telling spruces and firs apart, some of them very simple indeed as we shall see in a moment. But the Douglas-Firs (or Douglas-Spruces which they might just as well be called and sometimes are) are, strictly speaking, neither spruces nor firs. They are another kind of evergreen; they belong in another genus (with the mouth-filling barbaric scientific name of Pseudotsuga). In some ways they are like spruces, in some like firs, and in some just like themselves. Their most fantastic character is their cone. In addition to the chaste regular symmetry of brown scales of ordinary evergreens, it has bracts which stick way out between the scales like so many forked snake-tongues. The Douglas-Fir cone has a very gay unnatural look, like something thought up by an interior decorator.

The Douglas-Firs are most easily identified by the buds at the branch tips. The Douglas-Fir forms a whole species complex throughout the West, all the way from the Rockies to the coast. The various races have many minor differences but the buds at the branch tip differ from those of other conifers. They are slenderish and pointed, *and they narrow in at the base*. In other words, at the point where the bud springs from the twig, it is not quite as wide as it is just a little farther along. No other kind of evergreeen in christendom has a terminal bud of this sort.

With the Douglas-Firs (spruces) out of the way, it is easy to distinguish all the firs of the world from all the spruces. When spruce needles fall off they leave little sharp projections on the twigs. When fir needles fall off the severed connections are smooth. One can tell a fir from a spruce by touch alone. Just put your hand in back among the foliage till you come to the older twigs on which the needles have fallen. The firs feel like smooth twigs; the spruces are a regular succession of sharp little points that press into your flesh, a sort of super sandpaper. The Douglas-Firs (spruces) feel to the touch as they logically should. They are about half way between. They have little bumps where the needles fell off, but the bumps are not at all sharp.

"CHRISTMAS TREES AROUND THE WORLD"

EDGAR ANDERSON

The first week-end in December, from Thursday noon through Monday night, the Garden was host to an exhibit arranged by the Garden Club of St. Louis,* "Christmas Trees around the World." The Federated Garden Clubs, the Federated Women's Clubs, and the Horticultural Council of the Garden cooperated in selling tickets, and caring for the enormous crowds. Over nine-thousand visitors paid to see the Christmas trees and associated displays which were staged in the Museum building and in Mr. Shaw's old residence, "Tower Grove." There were trees of many countries in authentic detail, replicas of Mexican Christmas fiestas, and Japanese and Hawaiian holiday decorations. One of Mr. Shaw's old bedrooms was charmingly fitted up to represent a Victorian Christmas-time bedroom as it would have looked when the children had just run off downstairs. The room which now displays Mr. Shaw's personal library most appropriately showed a typical old-fashioned English Christmas with Yule log and boar's head and gifts wrapped up for the traditional English "Boxing Day," December 26th. Mr. Shaw's portrait hung prominently in the background of this English display, making him seem the personal host for the occasion, as indeed he was. He would undoubtedly have been pleased to see the beautiful old buildings erected under his personal supervision, again open for official entertaining as they were in his day; would have been pleased also with the taste and dignity with which the whole affair was conducted and the thousands of dollars which were raised for the Garden and for the new national home of the Federated Garden Clubs.

* By invitation several other St. Louisans created special Christmas exhibits to accompany the "Modern American" tree in the Museum building.

A BOTANY COURSE FOR GARDENERS

An introductory course in Plant Morphology and Physiology, sponsored by the Men's Garden Club of Webster Groves, will be given by Dr. John D. Dwyer, Research Associate at the Garden and Professor of Biology, St. Louis University. The course, consisting of eight sessions, will be given every other Monday, January 3–April 18, from 7:30 to 9:30 P. M., at the Museum Building in the Garden. It will give, in a simple fashion, the elements of plant structure and of how the plant lives and reproduces.

The course will be free to "Friends of the Garden" but enrollment is limited to fifty persons. Information on registration may be obtained by phoning the Garden, Prospect 6-5567.

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